

A large, rusted metal pipe extends from the left side of the frame, discharging a powerful stream of water into a concrete-lined channel. The water is turbulent and white with foam as it falls. In the background, there is a grassy field and some trees under a clear sky. To the left of the pipe, there is a blue and white cylindrical tank and some other industrial equipment.

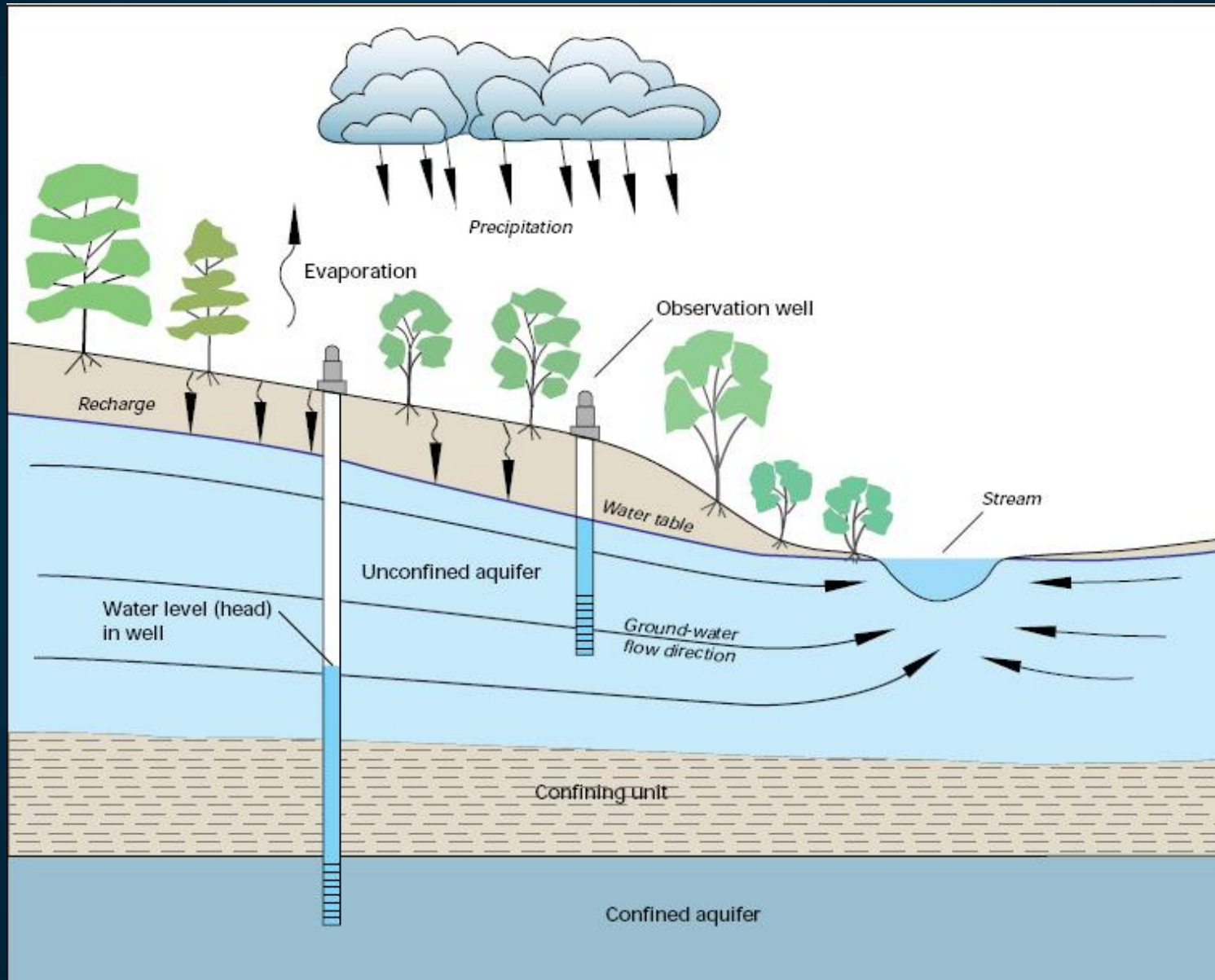
Santa Rosa Plain Basin Advisory Panel Groundwater Management and Groundwater Basics

**Marcus Trotta, Sonoma County Water Agency
Tim Parker, Parker Groundwater**

Presentation Overview

1. Science of Groundwater
2. Sonoma County Water Resources
 - Santa Rosa Plain Groundwater/USGS Study
- Q&A
3. Groundwater Management Planning
 - Forms and Options for Groundwater Management
 - Sonoma Valley Example
 - Santa Rosa Plain
4. Wrap-up, Questions & Feedback

Hydrologic Cycle

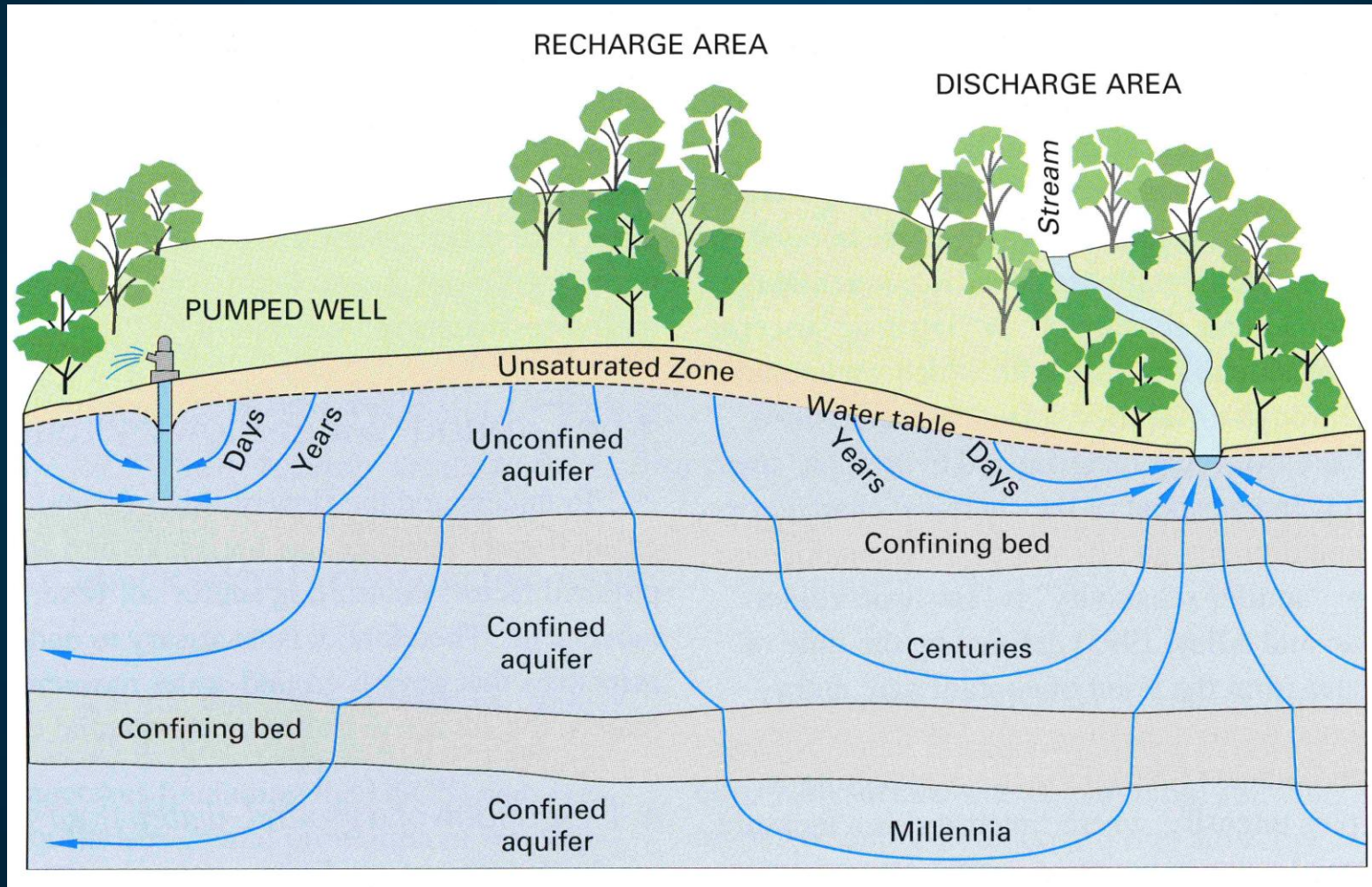


Example of Water Yield from a Volume of Saturated Aquifer Material

15% storage coefficient

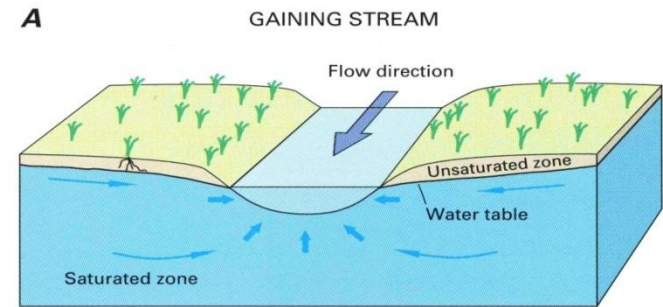


Groundwater Movement Between Recharge and Discharge

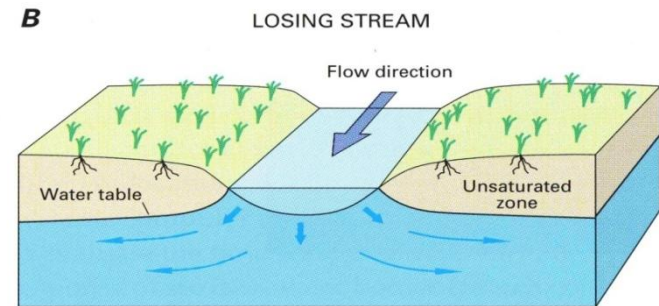


Gaining and Losing Streams

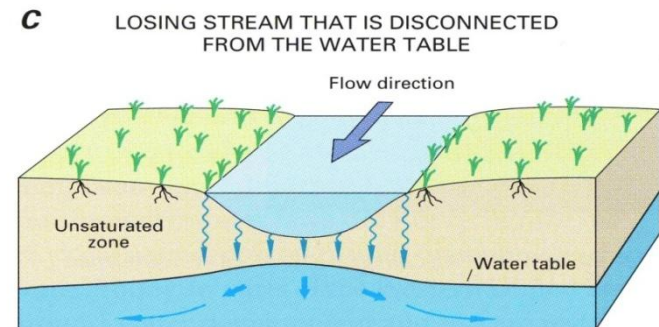
Stream gains
water from
groundwater



Stream loses
water to
groundwater

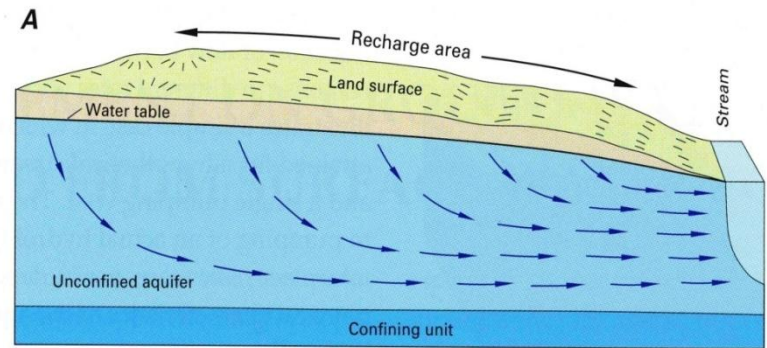


Groundwater
Mounds beneath
the stream

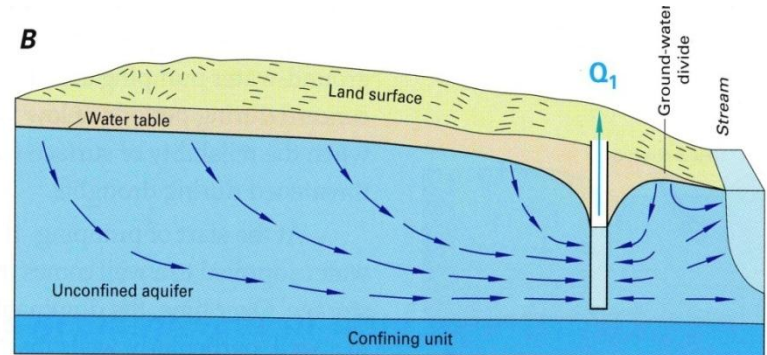


Wells, Surface Water, and Groundwater

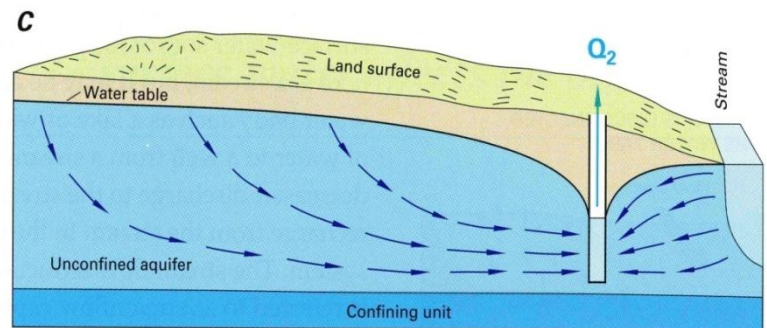
Static
conditions



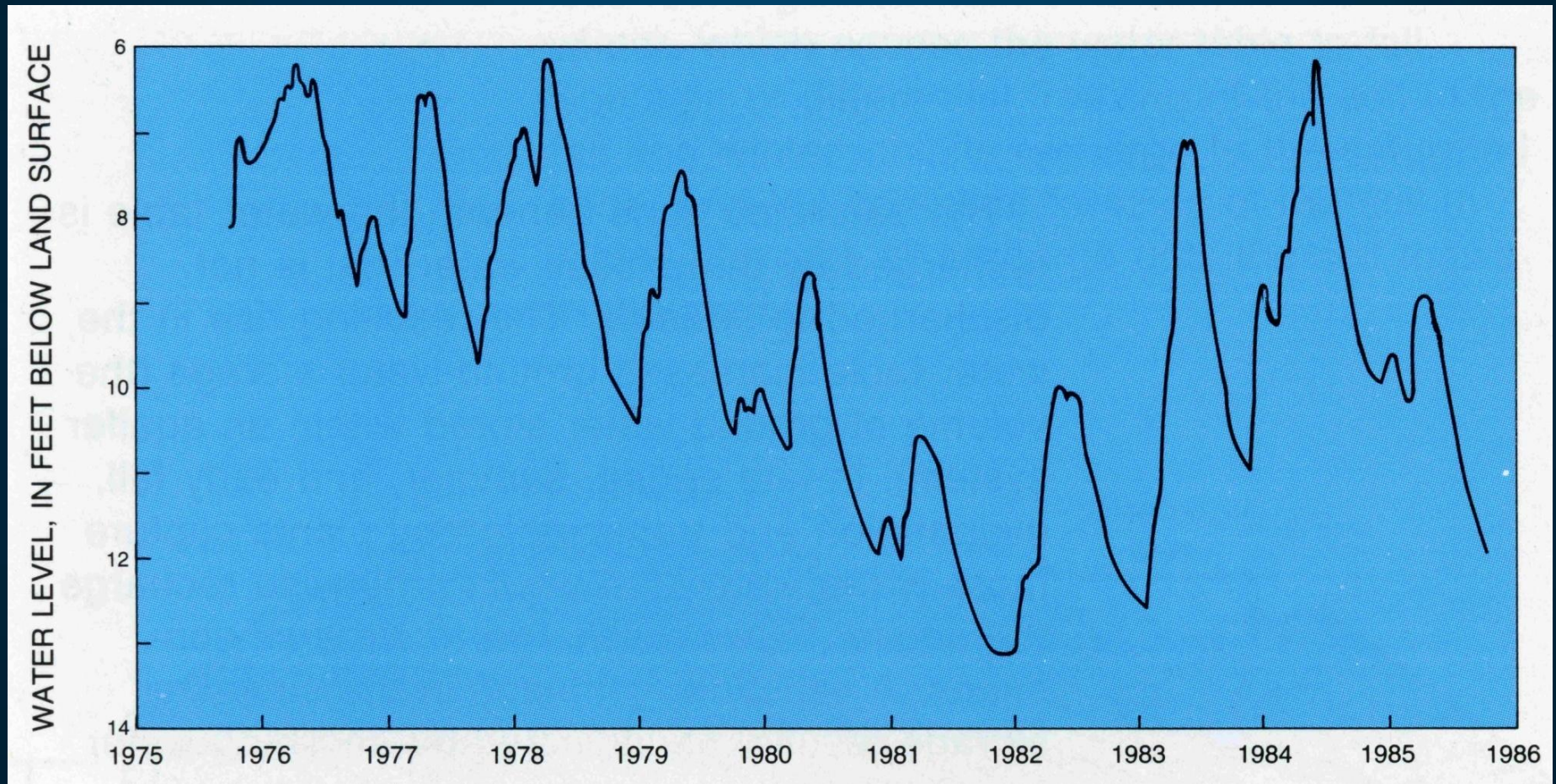
Initial
well(s)
pumping



Well(s)
pumping
over time

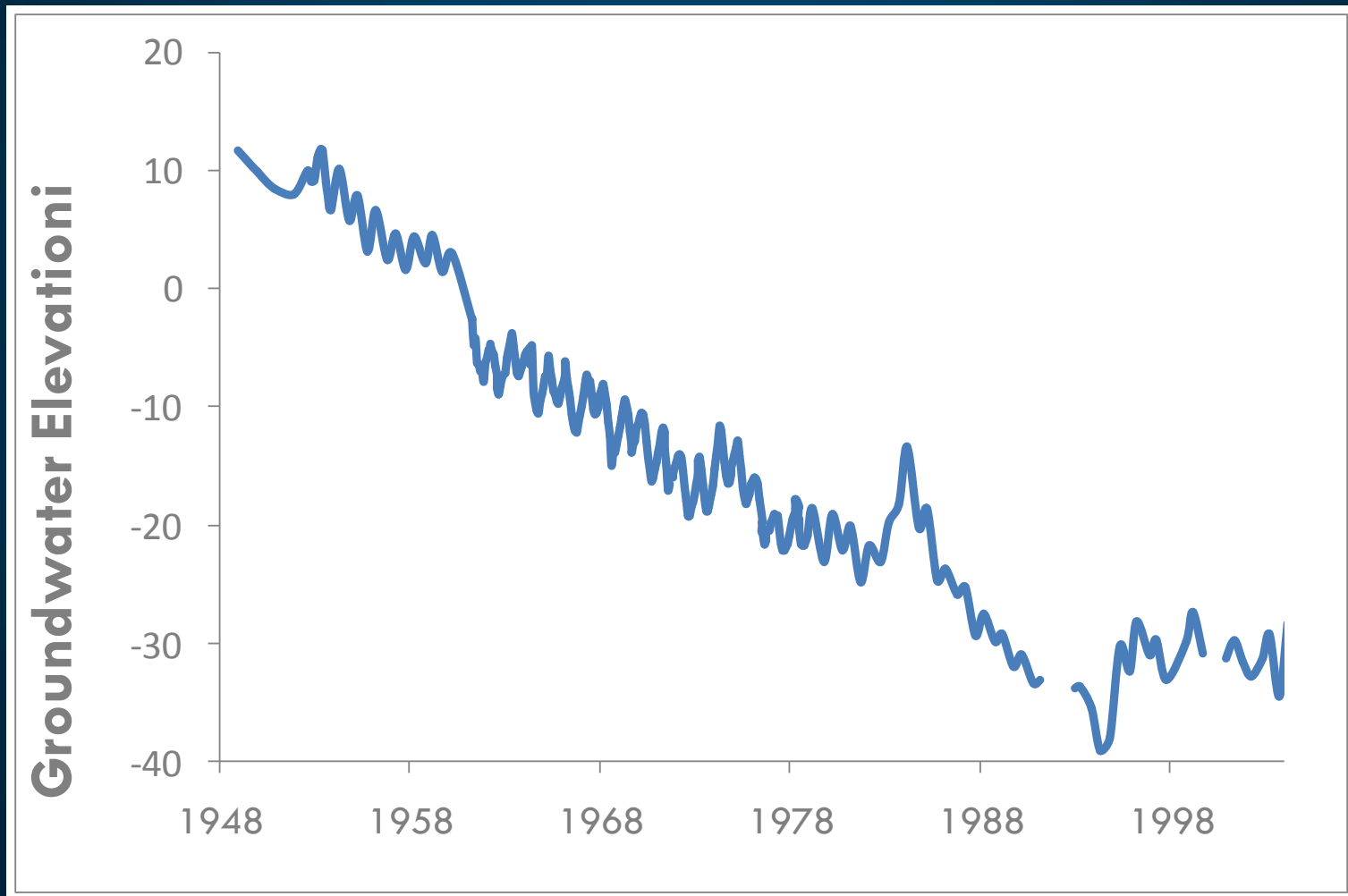


Groundwater Levels Change Seasonally and Climatically



Well Hydrograph, Groundwater and the Rural Homeowner, U.S. Geological Survey

Groundwater Levels: Discharge Exceeds Recharge

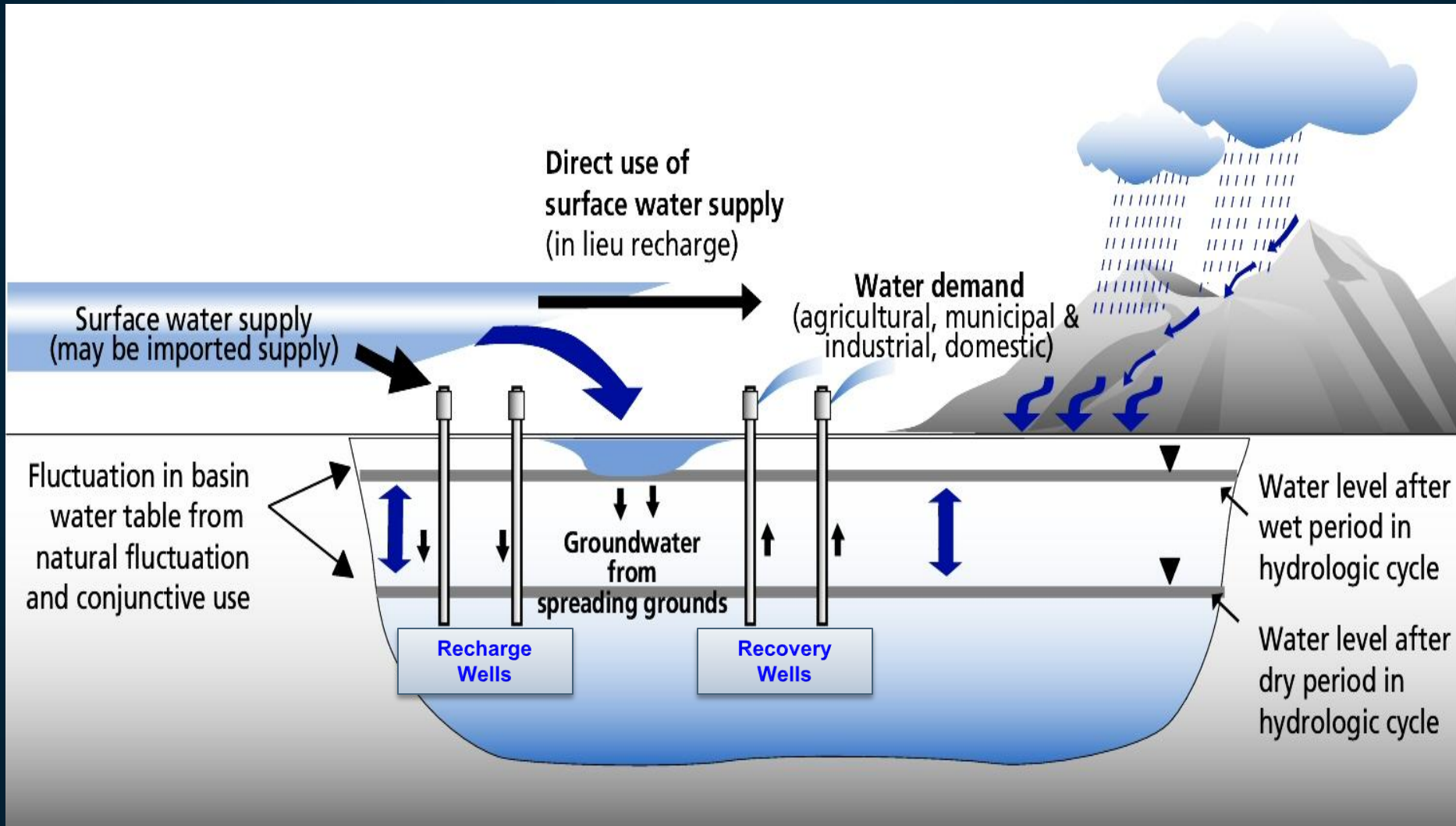


Well Hydrograph, Water Well Database, California Department of Water Resources

Basin Yield

- Basin Yield \neq Recharge
- Mining $=$ Annual extractions that consistently exceed Basin Yield
- Basin Yield \neq Groundwater in Storage

Groundwater Banking



Groundwater Quality

Common Constituents of Concern

Natural Occurring

- Salinity 99%*- Na, Ca, Mg, K, HCO_3 , Cl, SO_4 , NO_3 , Si
- Arsenic
- Radon
- Iron
- Manganese
- Boron

Anthropogenic/Human

- Nitrate
- Pesticides/herbicides
- Fuels
- MtBE
- Solvents
- Metals
- Bacteria/pathogens
- Pharmaceuticals

* sodium, calcium, magnesium, potassium, bicarbonate, chloride, sulfate, nitrate, silicon

Sonoma County Water Resources

Sonoma County Water Agency

Russian River System

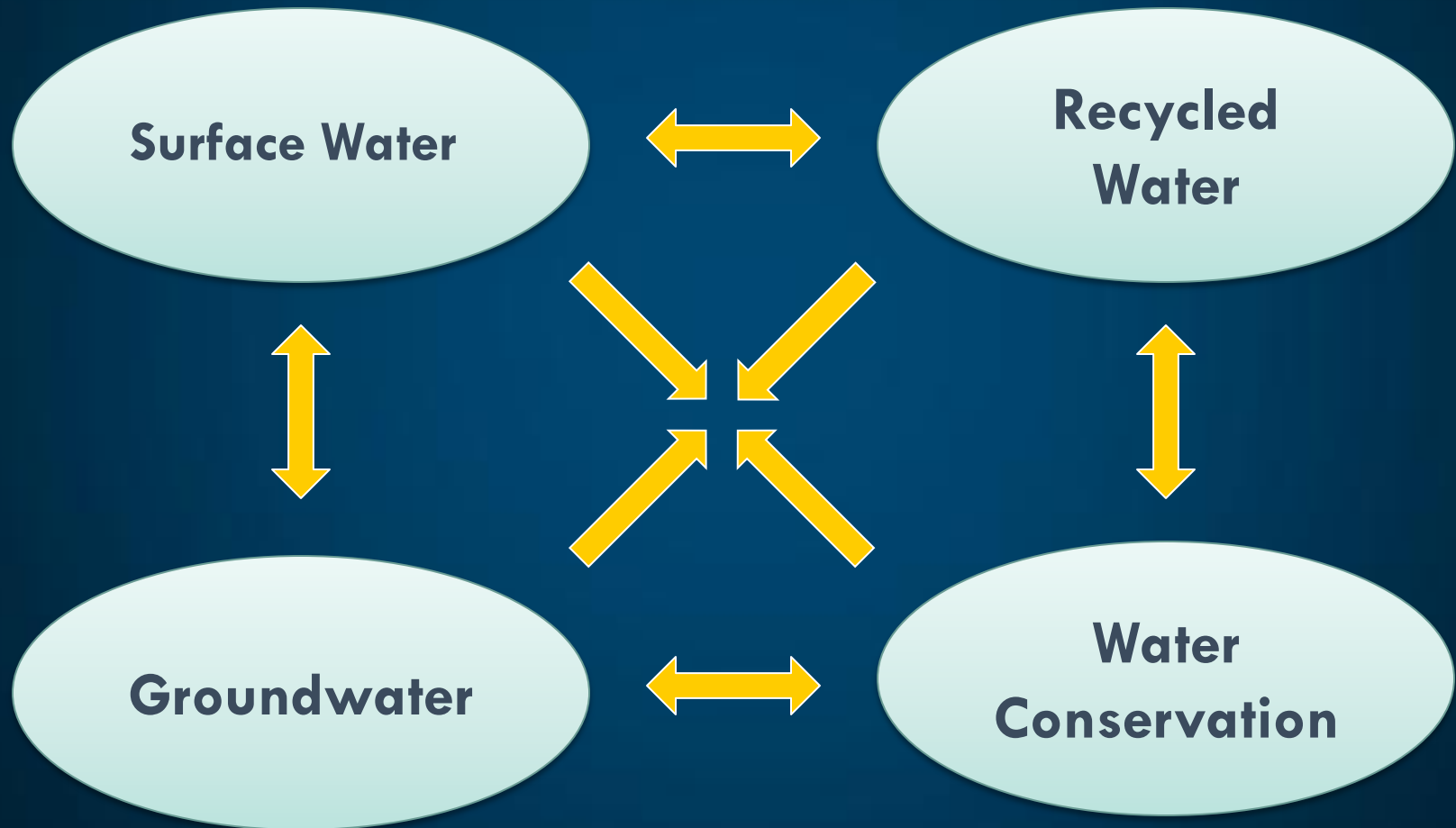
Endangered Species
& Flow Regulations

Drought

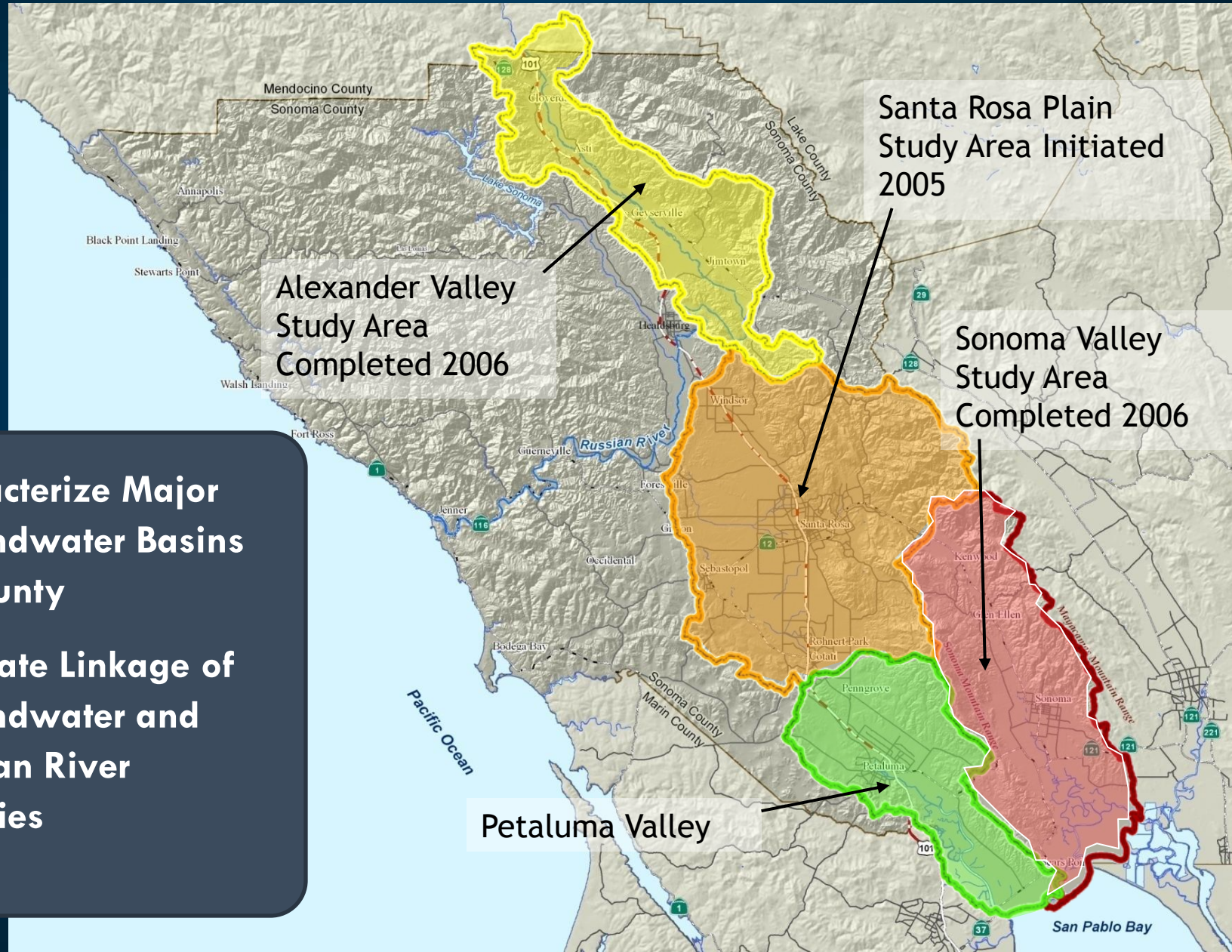
Climate Change



Interconnection of Water Supplies



USGS Groundwater Studies



- **Characterize Major Groundwater Basins in County**
- **Evaluate Linkage of Groundwater and Russian River Supplies**



Santa Rosa Plain Groundwater Study Due 2012

OBJECTIVES

Hydrogeology and
Groundwater Quality

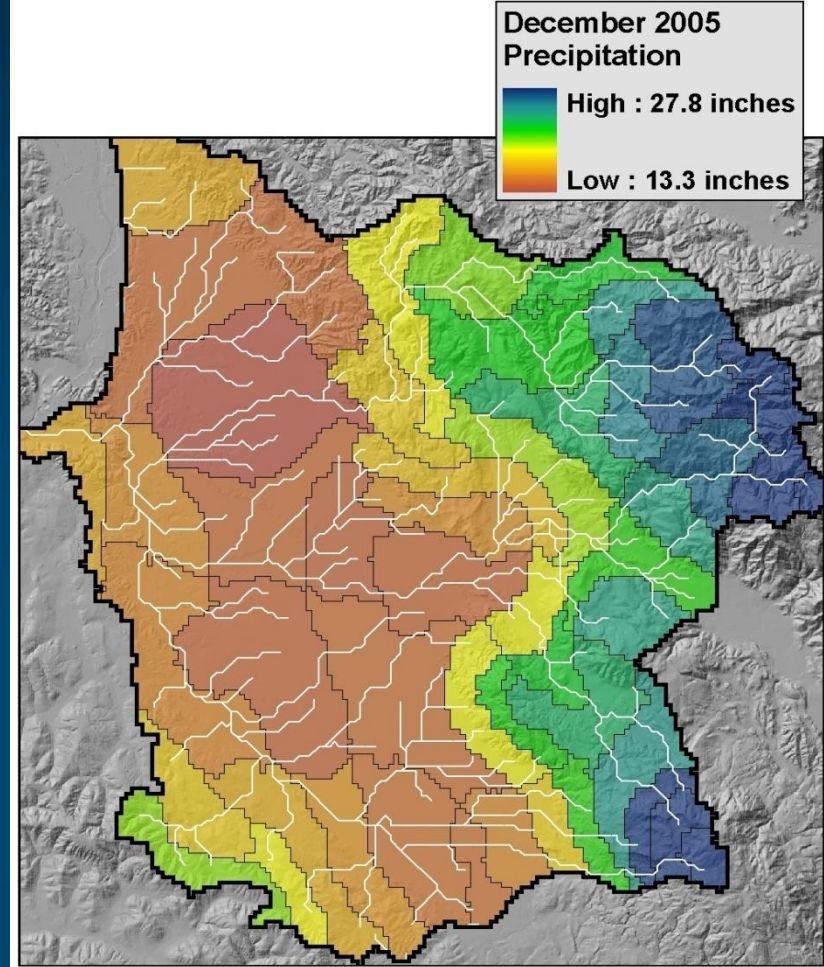
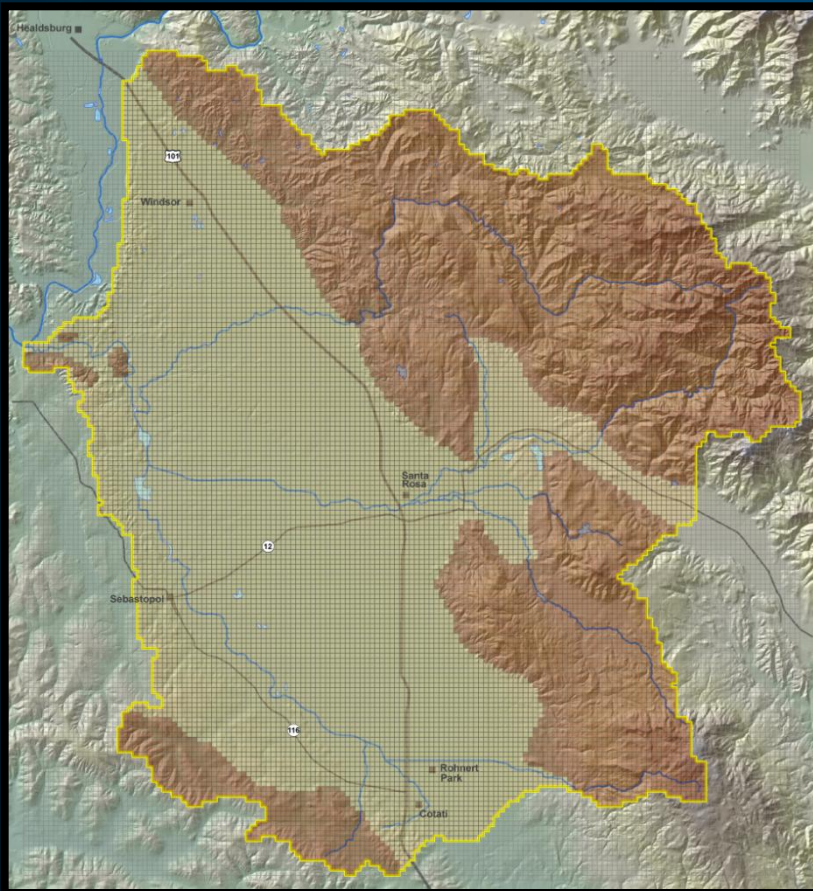
Surface Water-
Groundwater Model

Evaluate Potential Future
Conditions and
Alternative Water
Management Strategies



GSFLOW Model

Watershed: Surface
& Groundwater








- Estimate hydrologic budget
- Identify recharge areas
- Evaluate water-resource management strategies
- Evaluate climate-change impacts
- Evaluate effects of changes in land-use



Santa Rosa Plain Geology and Primary Hydrogeologic Units

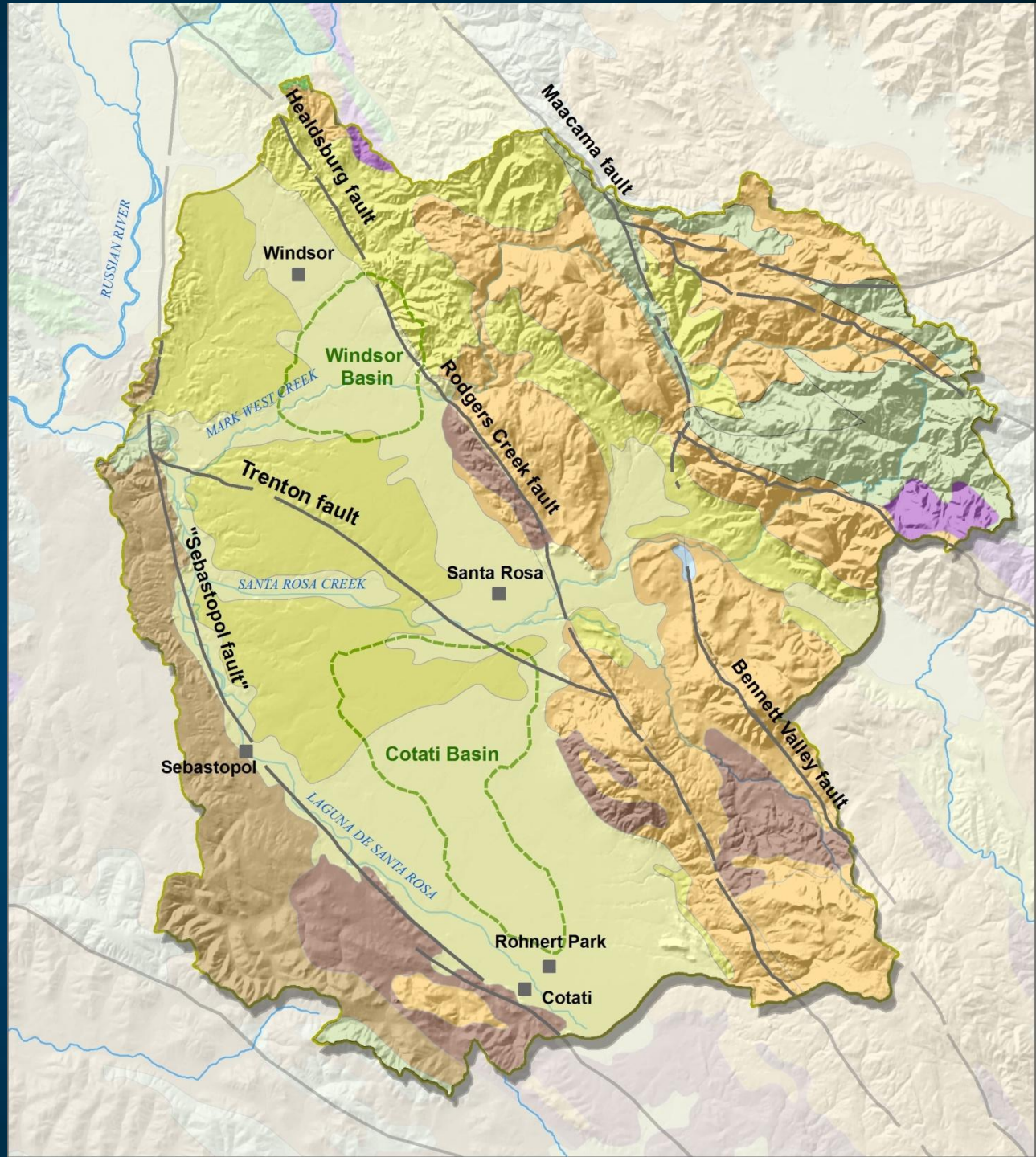
- Alluvium/Glen Ellen
- Petaluma
- Wilson Grove
- Sonoma Volcanics

Sedimentary and Volcanic Units

	Quaternary Alluvium
	Glen Ellen Formation
	Petaluma Formation
	Wilson Grove Formation
	Sonoma Volcanics

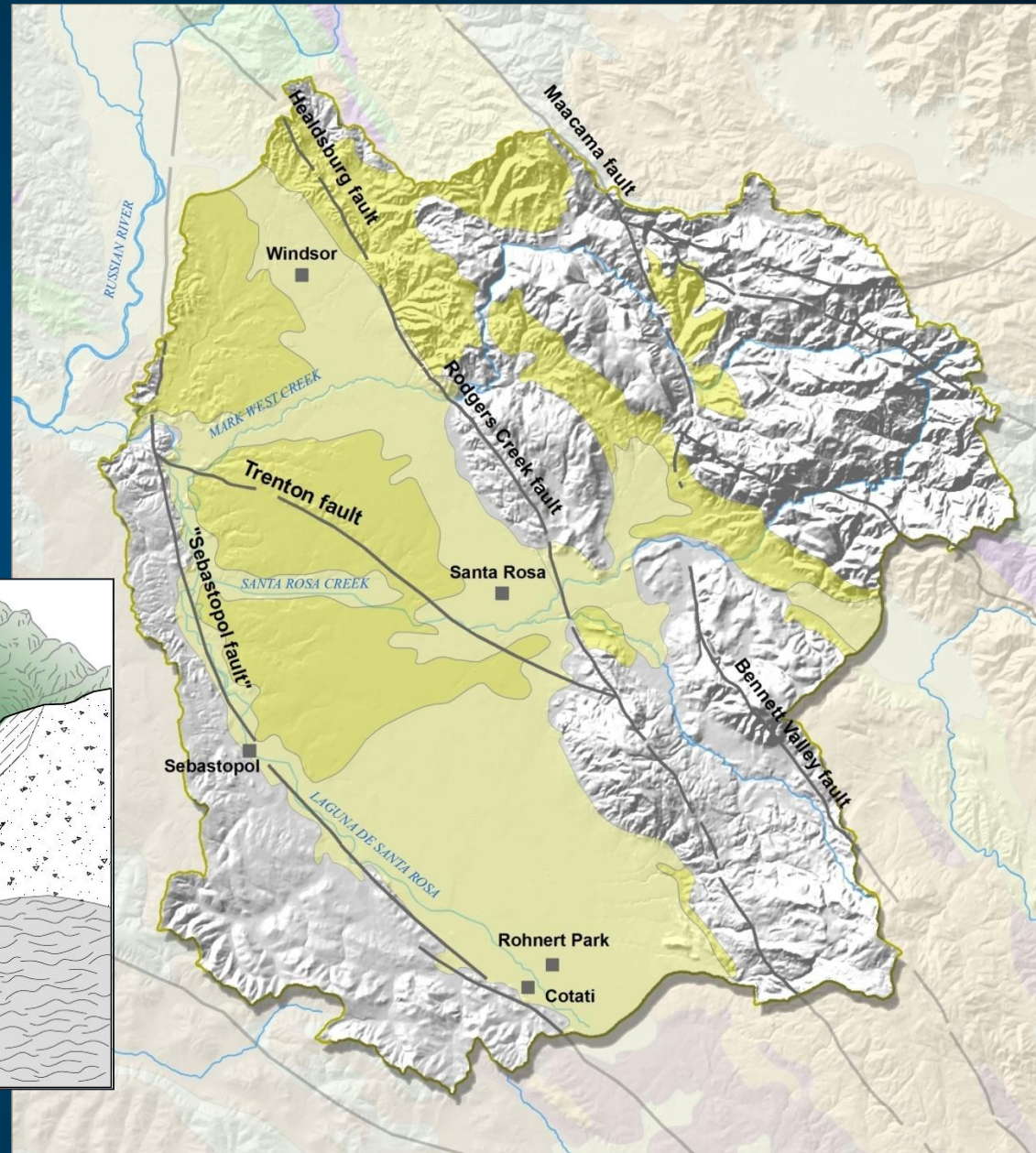
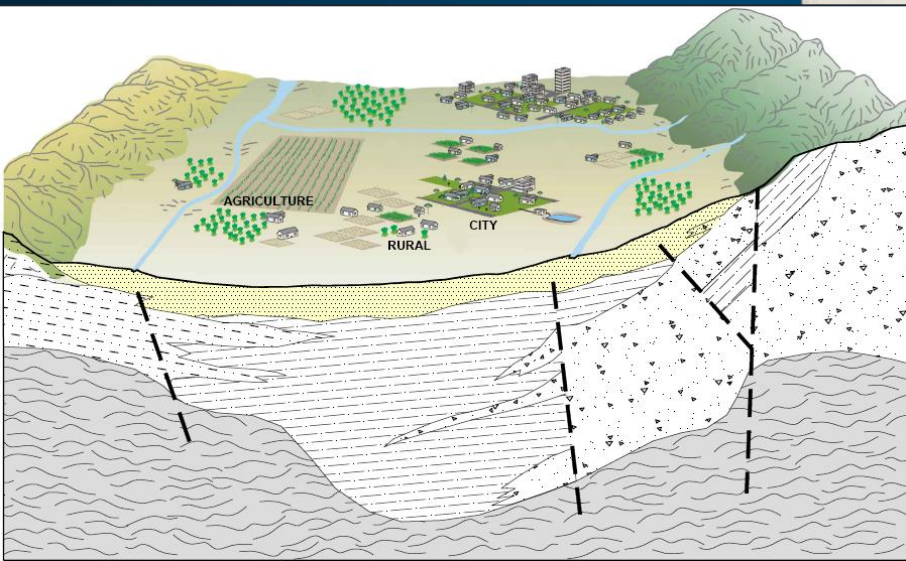
Bedrock Units

	Franciscan Complex
	Ultramafic rocks



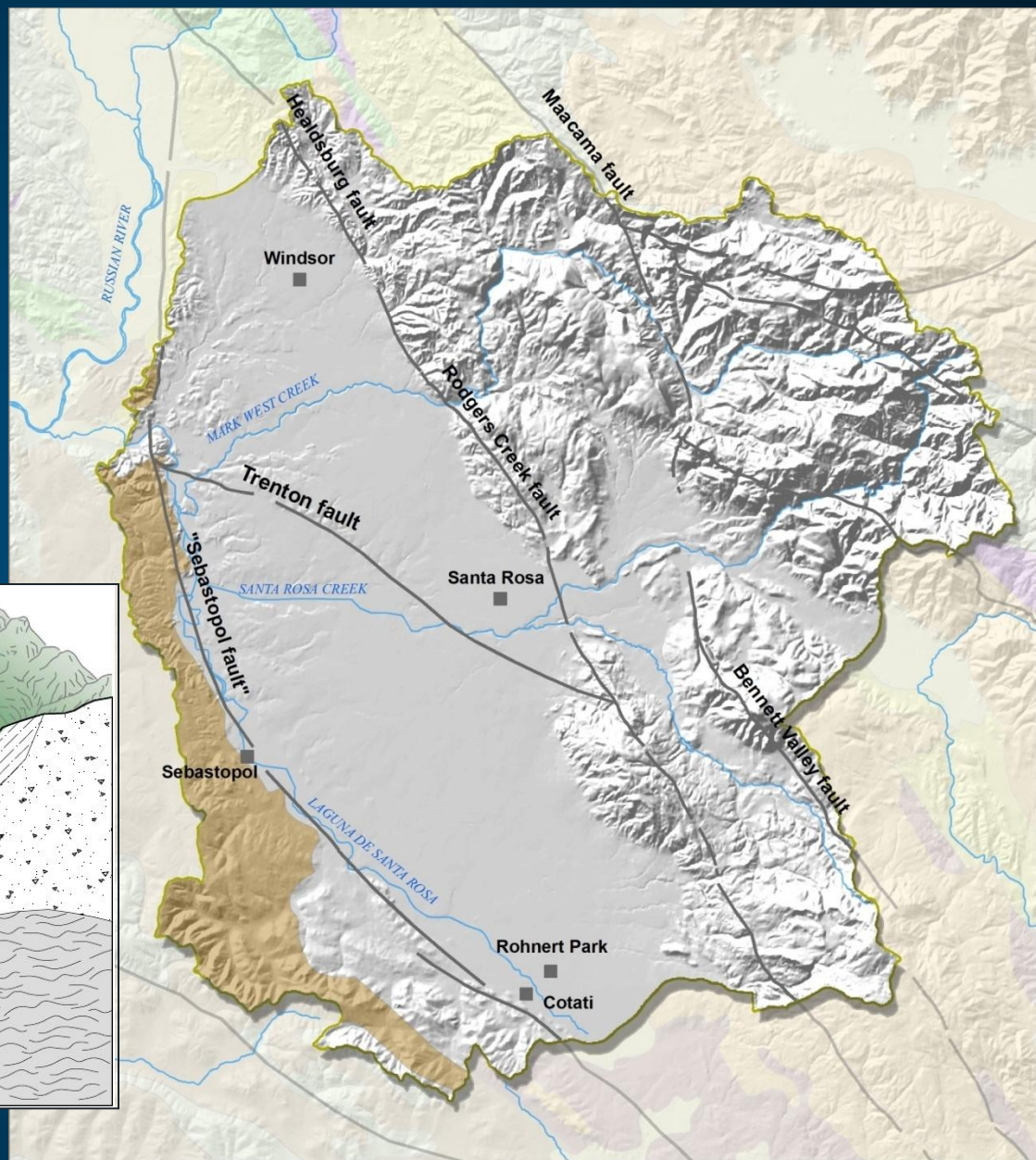
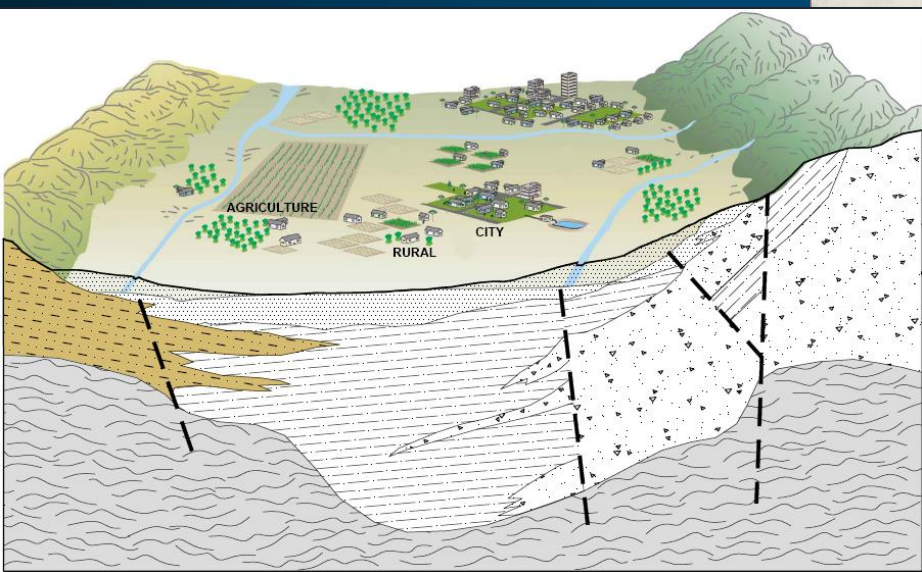
Alluvium & Glen Ellen Formation

- Widespread
- Relatively Shallow Aquifers (up to 50 to 300 feet deep)
- Variable composition (sand, silt, gravel and clay)



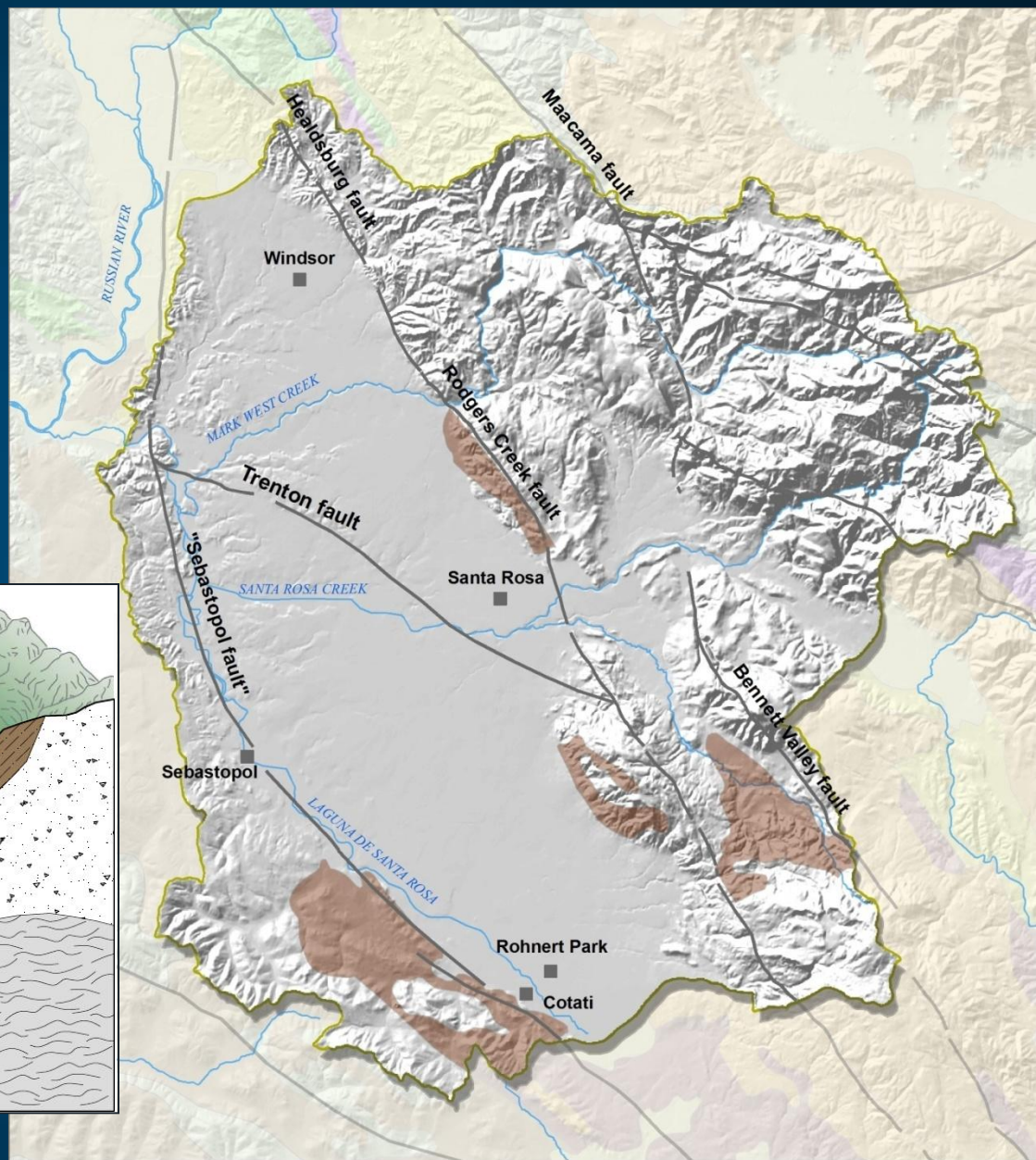
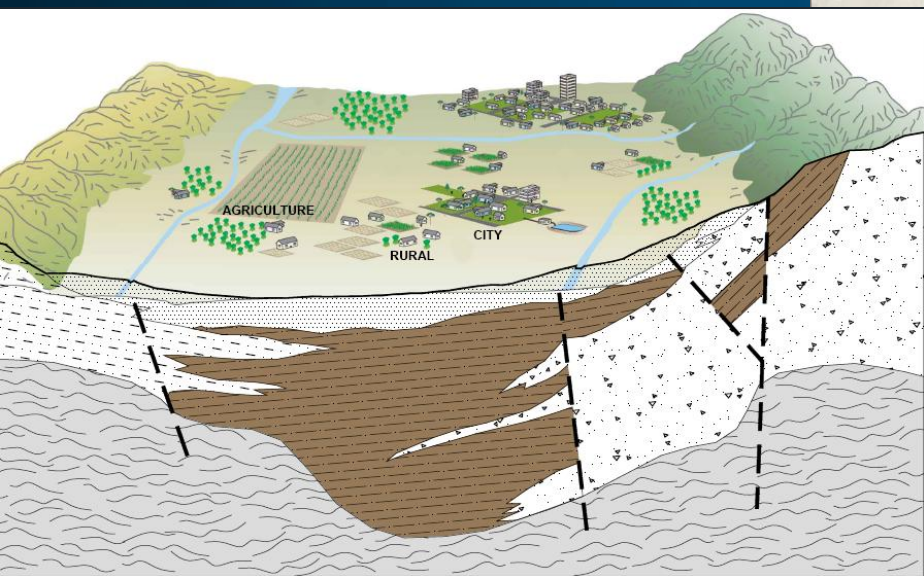
Wilson Grove Formation

- Occurs in Western Areas
- Relatively thick (up to 500 to 1,000 feet)
- Marine sandstones and clays
- More productive aquifers



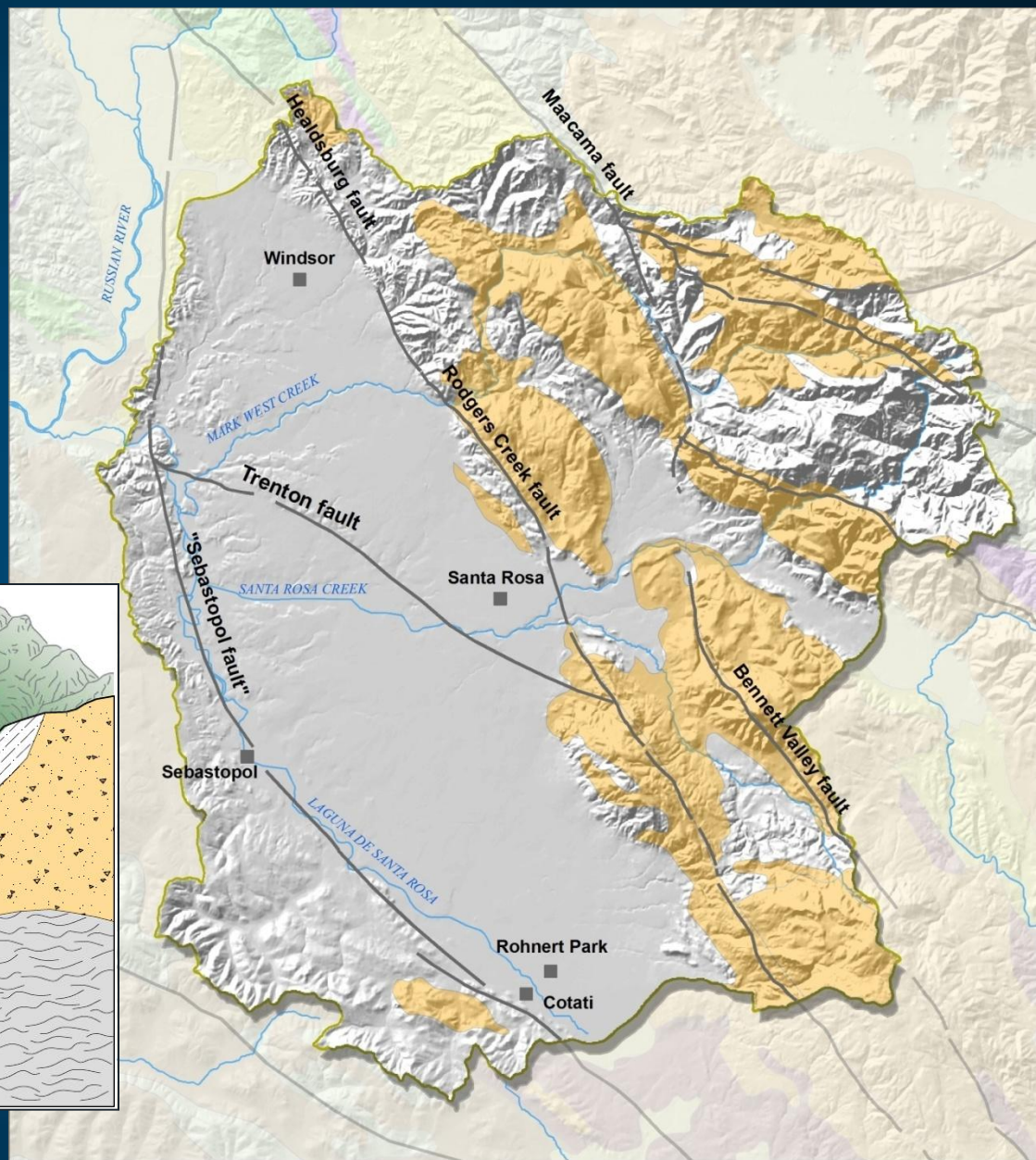
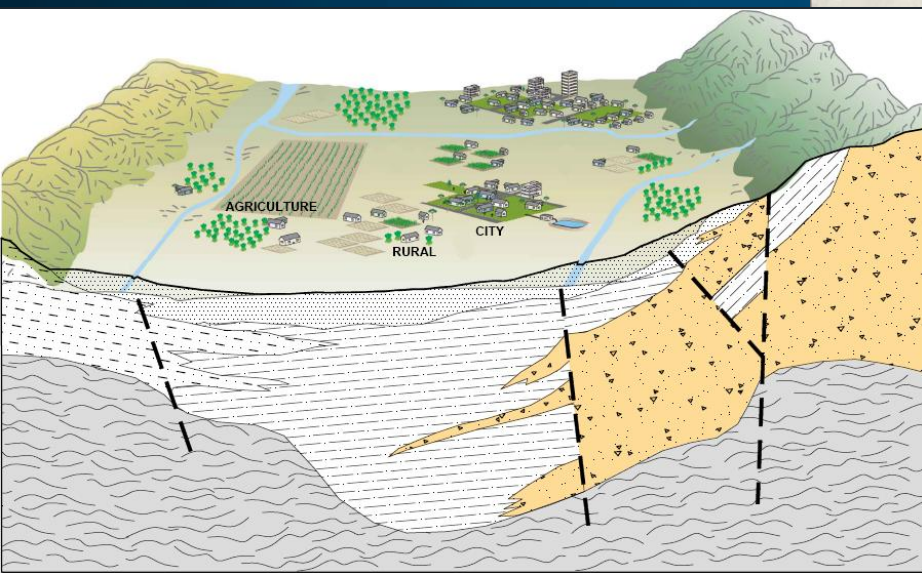
Petaluma Formation

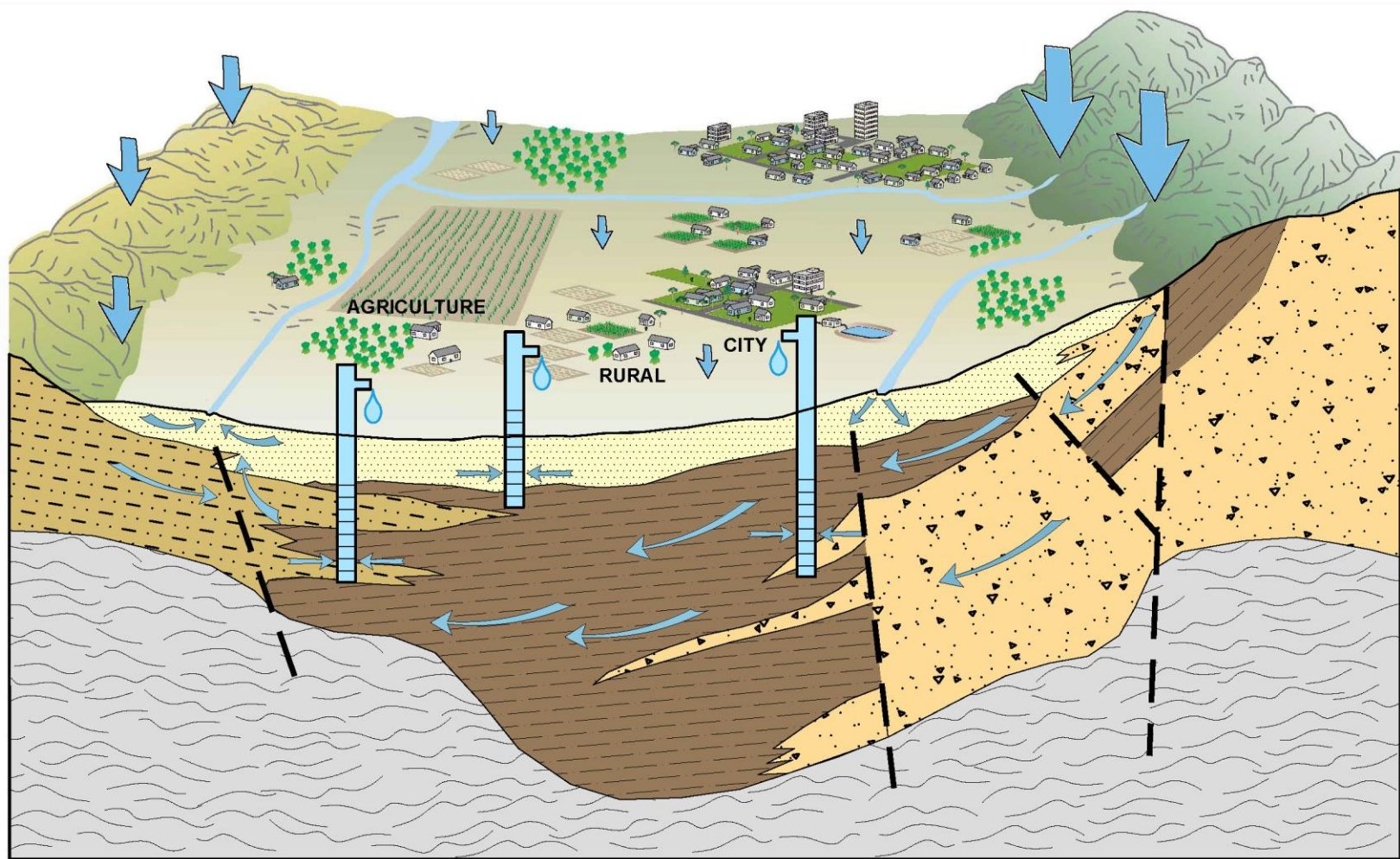
- Limited at Surface, but widespread underground
- Very thick (2,000 to 3,500 feet)
- Clay-rich with lesser sands and gravels
- Moderately productive aquifers



Sonoma Volcanics

- Occurs in Eastern Highlands
- Volcanic flow rocks, ash beds and volcanic sediments
- High variability in aquifers





ALLUVIUM &
GLEN ELLEN
FORMATION

WILSON GROVE
FORMATION

PETALUMA
FORMATION

SONOMA
VOLCANICS

BEDROCK

FAULT ZONE

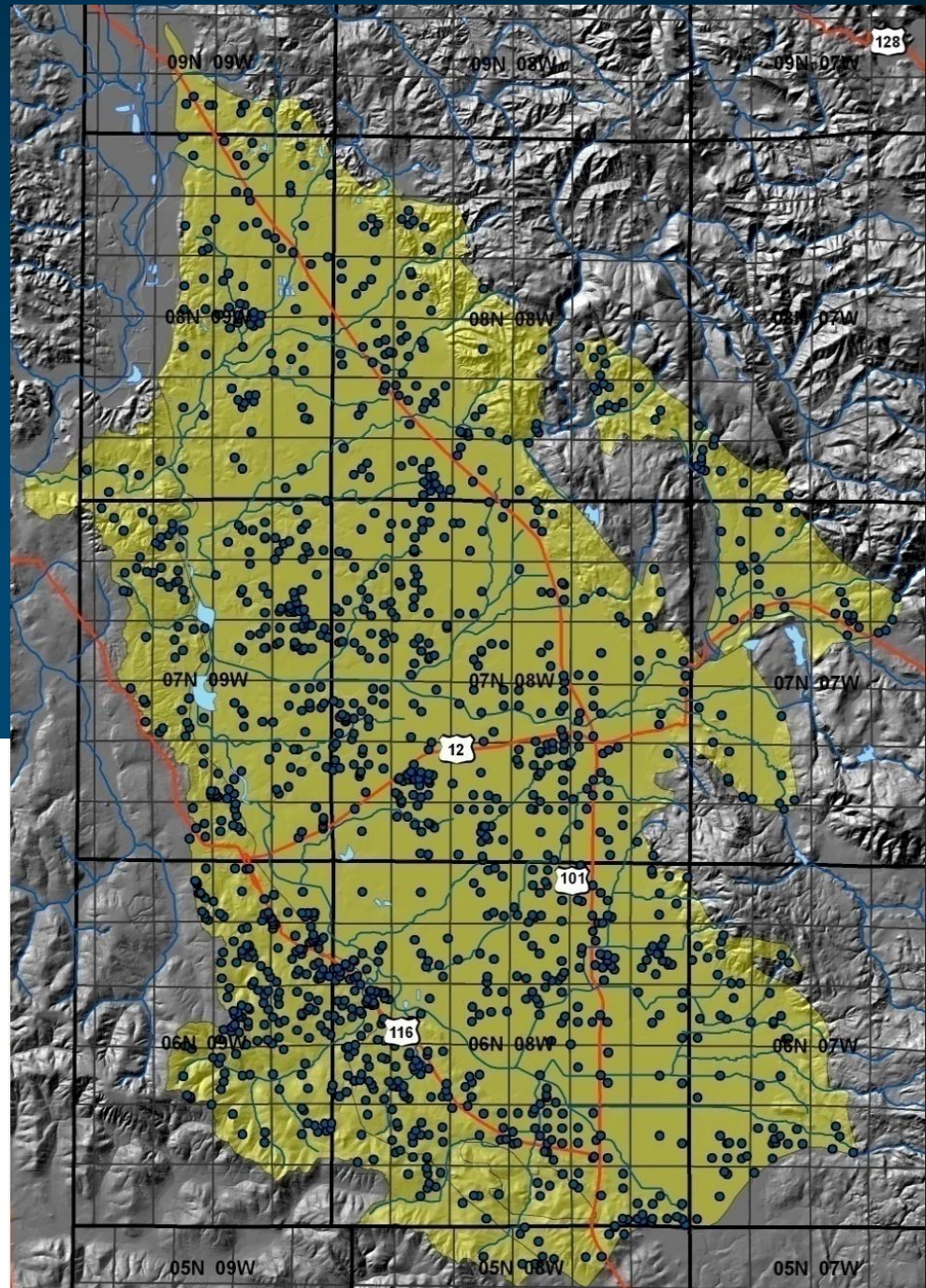
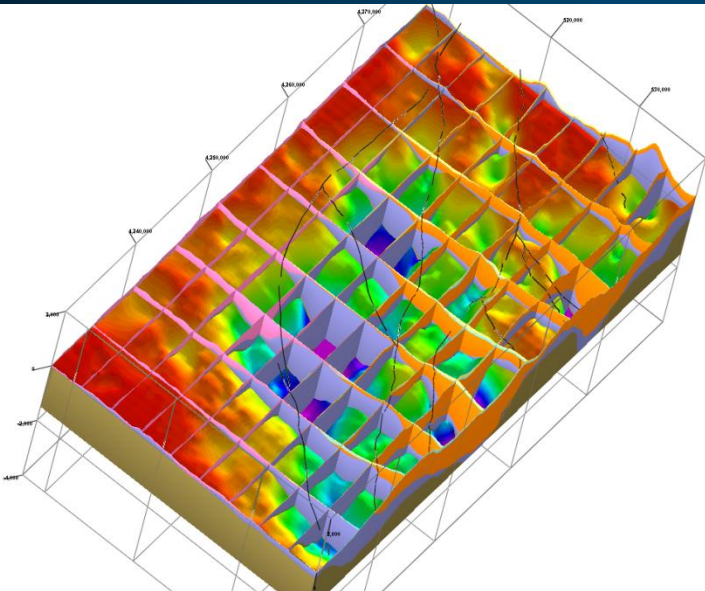
GENERAL DIRECTION OF
GROUNDWATER MOVEMENT

RECHARGE OF
GROUNDWATER

Water Wells in the Santa Rosa Plain ~12,000 Water Wells

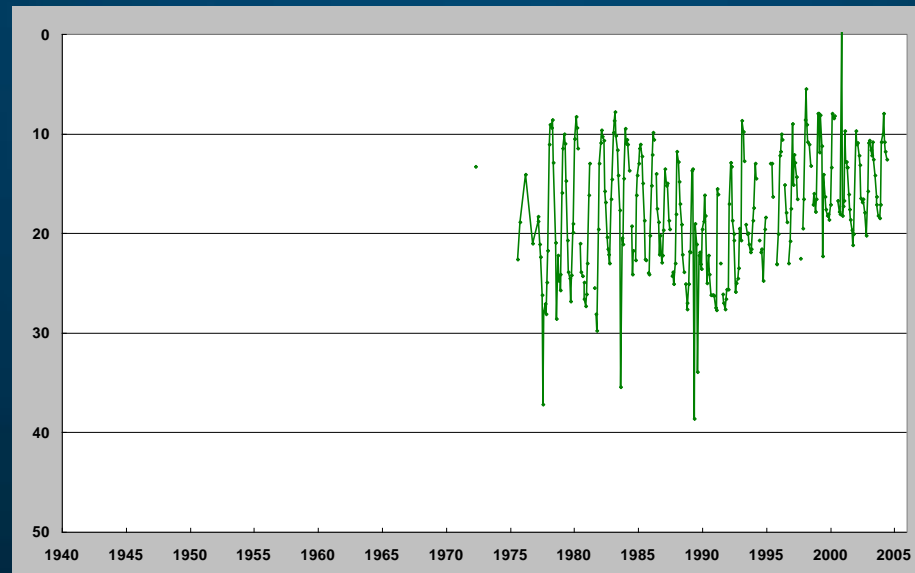
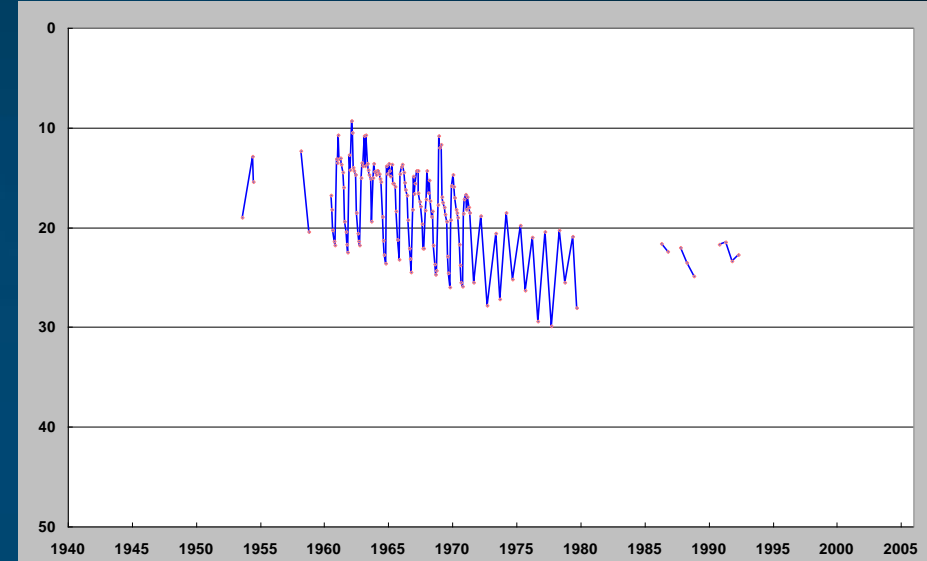
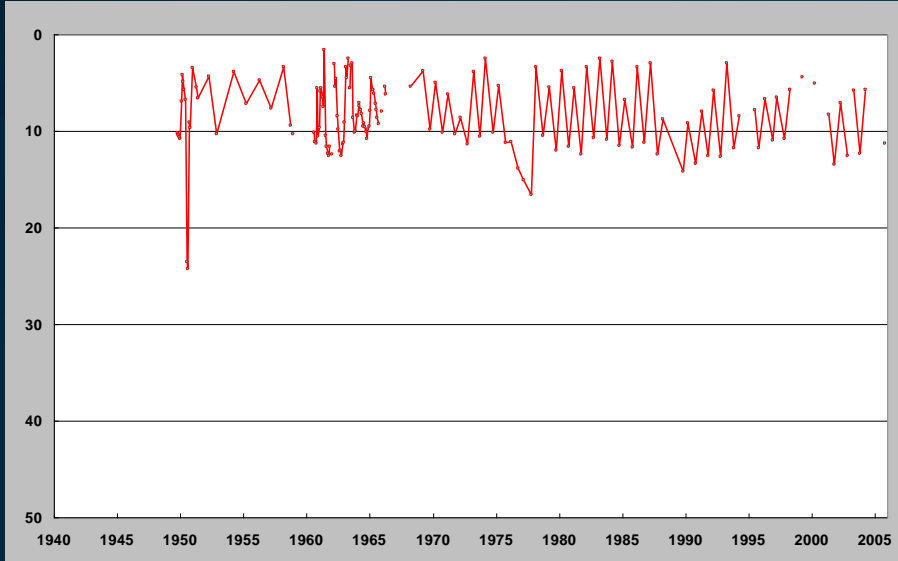
Supply

- Cities
- Rural Homes
- Agriculture
- Industries & Commercial



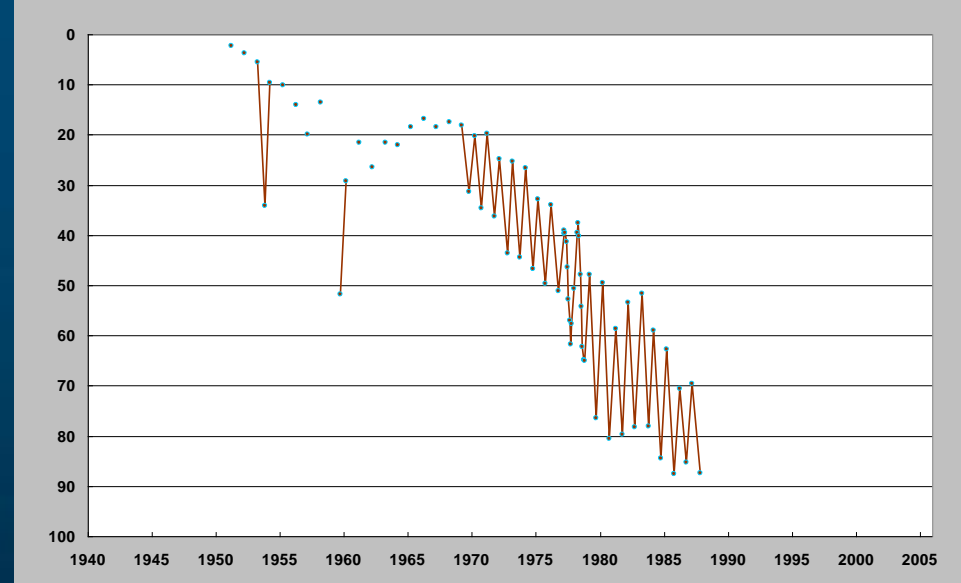
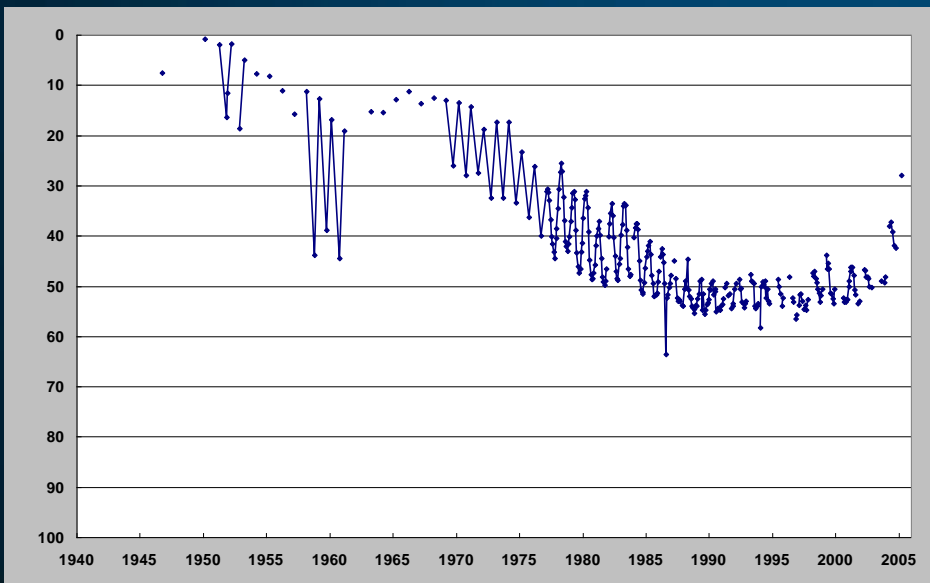
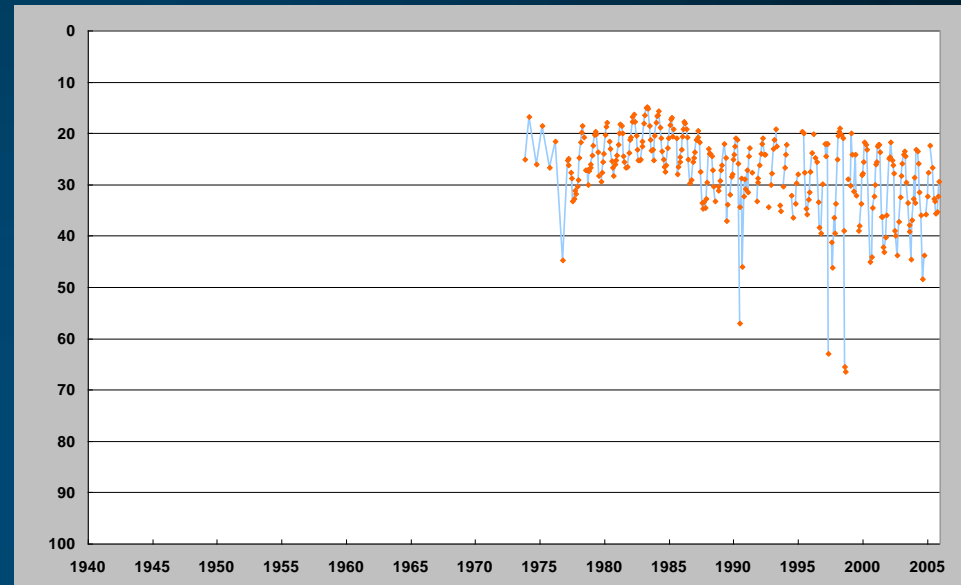
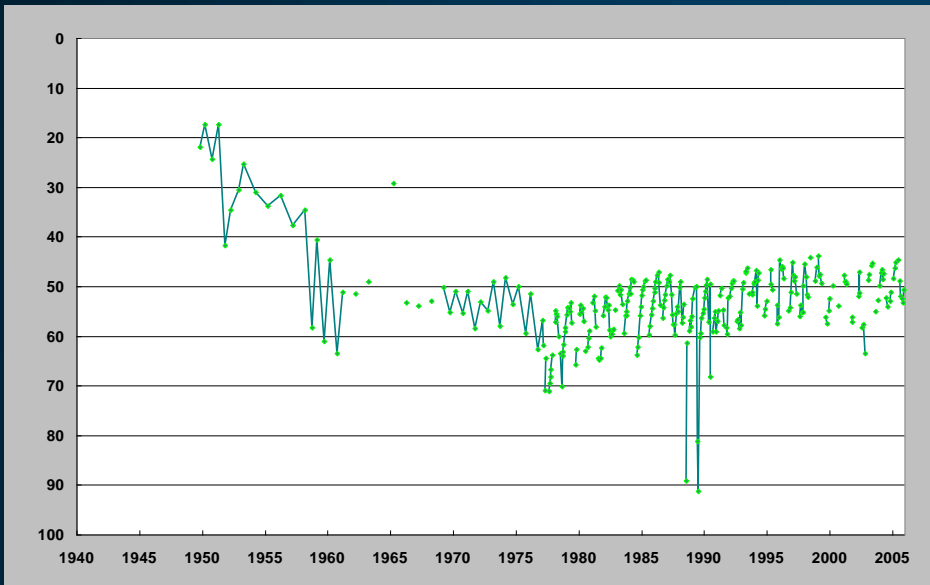
Groundwater-Level Trends

Select Shallow-Zone Wells



Groundwater-Level Trends

Select Deeper-Zone Wells



Groundwater Quality

Many Aquifers in the
Santa Rosa Plain Produce
High Quality Water

Large **variability**: some areas
of naturally occurring iron,
manganese, arsenic

Localized impacts of nitrates
and organic contaminants

Higher **salinity** water with
depth



Age of Groundwater
Indicates How Long
Aquifers take to Naturally
Replenish
(USGS Study)

Q&A

www.scwa.ca.gov/srgroundwater

Groundwater Management Planning

- Why are we talking about this?
- Water rights and methods of management
- Sonoma Valley Example
- Santa Rosa Plain

Why Talk about Groundwater Management Planning?

- To increase knowledge
- To generate interest by explaining how it has helped the Sonoma Valley and how it could help here

**Whiskey is for
Drinkin'
Water is for
Fightin'**

attributed to *Mark Twain*



Groundwater law



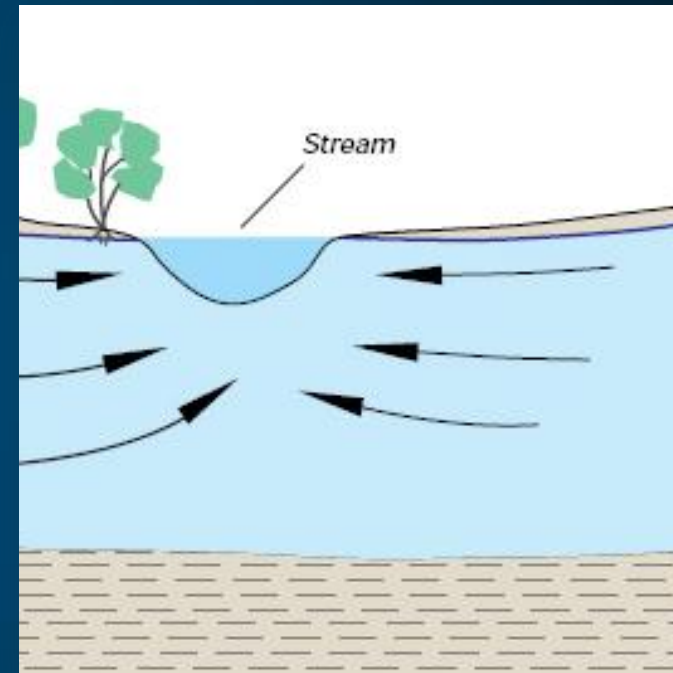
- Groundwater law is
 - Complex
 - Situation specific
- For advice on specific issues, contact your water attorney

One Resource

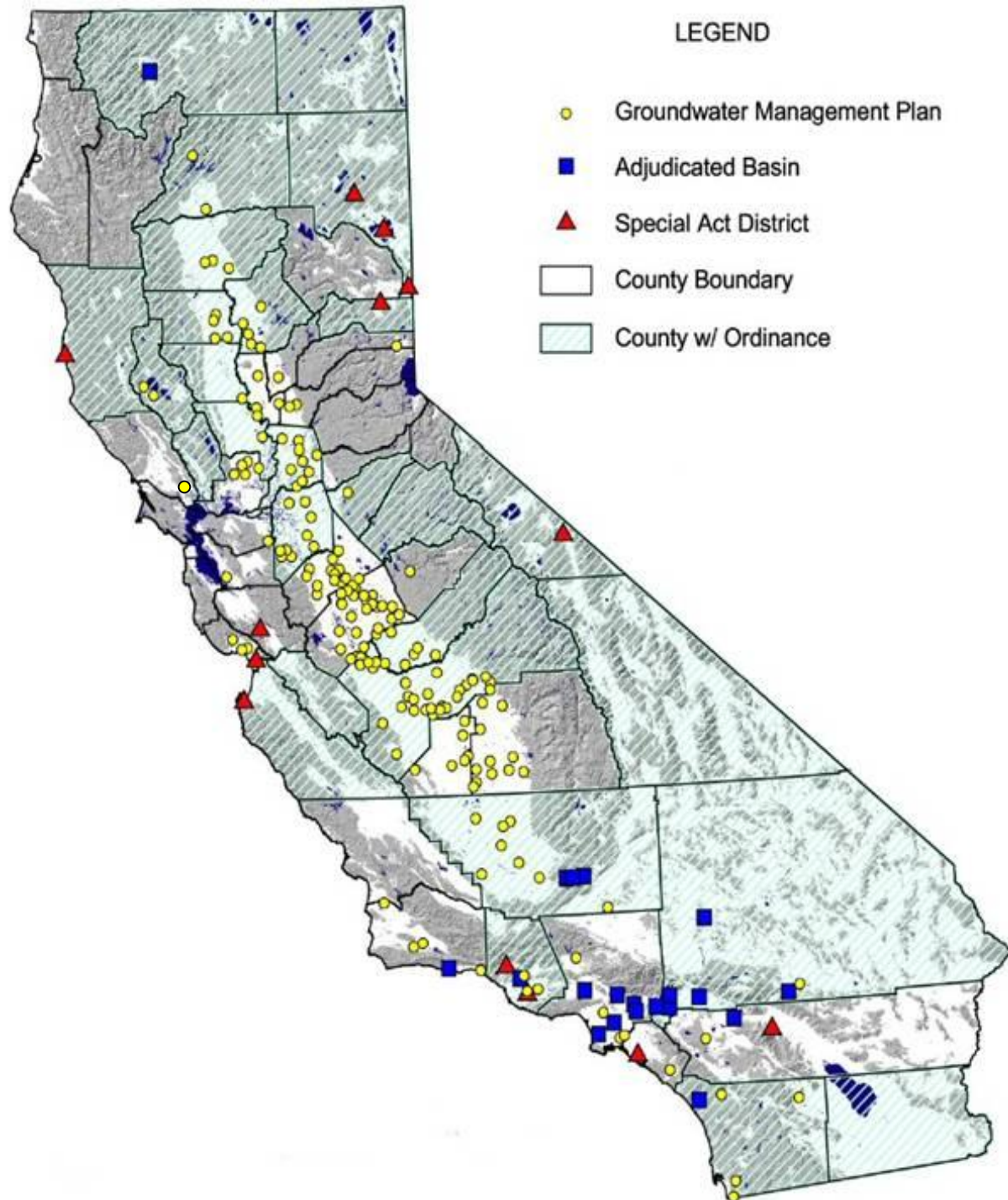
The legal system treats
percolating groundwater and
surface water as 2 separate
resources

BUT...

Groundwater and surface
water are interactive and
are really one resource



- **Overlying Landowners**
- **Local Agencies**
 - Over 1,000 agencies
 - Groundwater Management Plans
 - Special Act District
- **Adjudicated Basins**
- **County with Ordinance**



Groundwater Management

With

- Maintain water quality
- Stabilize groundwater levels
- Meet existing and future water demands
- Diversify supply

Without

- Damaged aquifer
- Poor groundwater quality
- Drilling deeper wells at greater expense
- Potential land subsidence
- Potential legal battles or adjudication for management control

So What is the Best Way to Manage Groundwater?

- Voluntary, Non-Regulatory Plans
 - Collaborative and cooperative mechanism for stakeholders to work together and to develop and implement

Successful Groundwater Programs

- Legal authority
- Cooperate with overlying landowners
- Benefit all basin groundwater users
- Provide a sustainable water supply
- Optimize water use thru landscape ordinances, conservation, recycling, & conjunctive use

What is Groundwater Management?

Stakeholders

- Define basin management objectives
- Develop management strategies to meet objectives
- Develop implementation schedule and budget

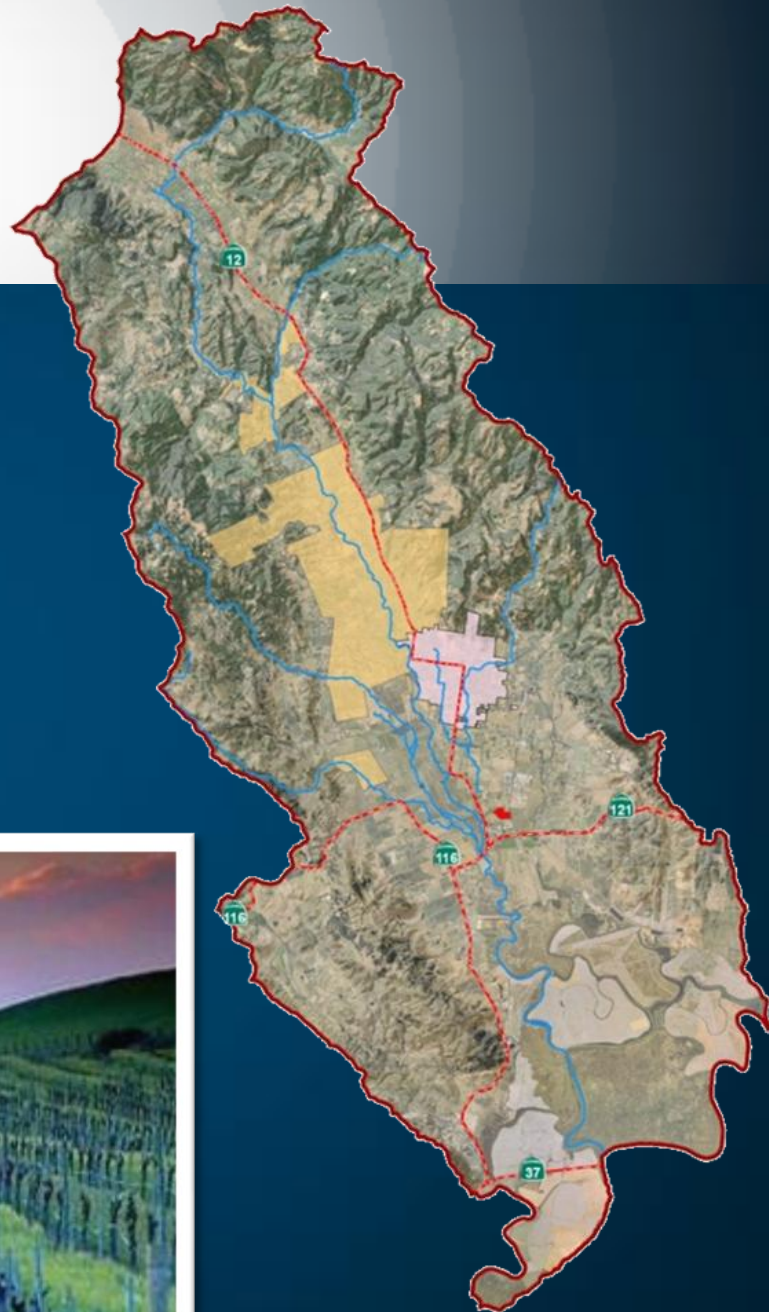
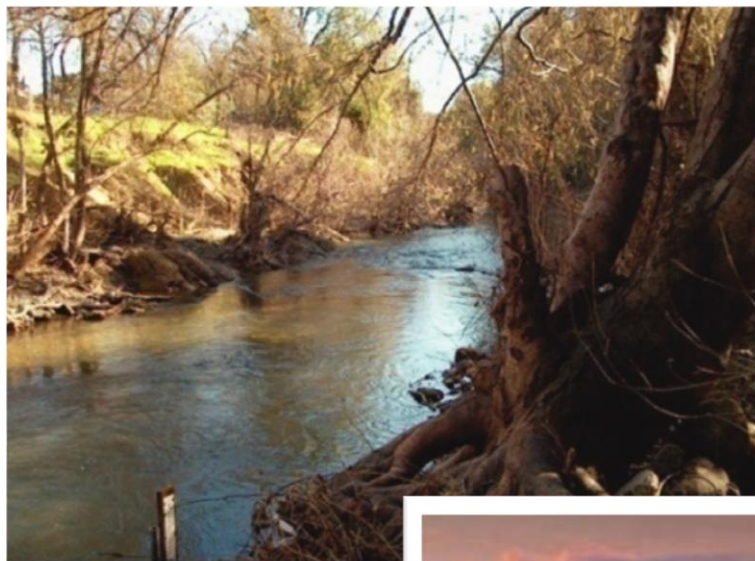
Bulletin 118-2003, Appendix C

<http://www.groundwater.water.ca.gov/bulletin118/update2003/index.cfm>

How Does it Work?



Sonoma Valley Groundwater Management Program



Non-Regulatory, Collaborative Groundwater Management

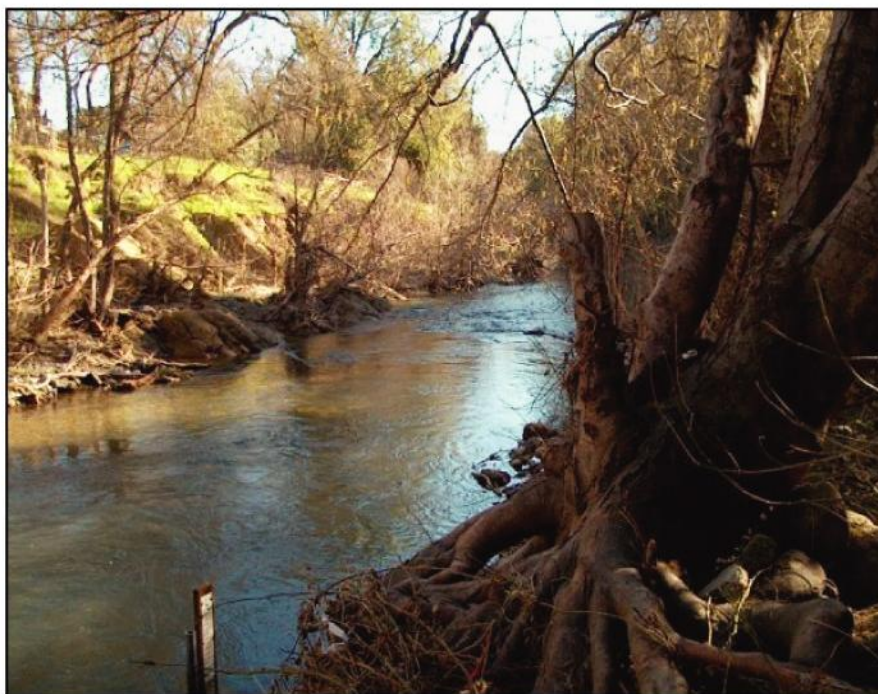
- Local Control
- State Funding
- Sustainability
- Quality
- Coordinate Water Supply
- Prevent Overdraft

Stakeholders for a Locally-Driven Plan – Sonoma Valley

- City of Sonoma
- County of Sonoma
- Madrone Vineyard Management
- Mission Highlands Mutual Water Company
- Mulas Family Winery
- North Bay Agricultural Alliance
- Rural Well Owners
- Sonoma County Water Agency
- Sonoma County Water Coalition
- Sonoma Ecology Center
- Sonoma Valley Vintners & Growers Alliance
- Southern Sonoma County Resource Conservation District
- Valley of the Moon Water District

In cooperation with the
SONOMA COUNTY WATER AGENCY

Geohydrological Characterization, Water-Chemistry, and Ground-Water Flow Simulation Model of the Sonoma Valley Area, Sonoma County, California

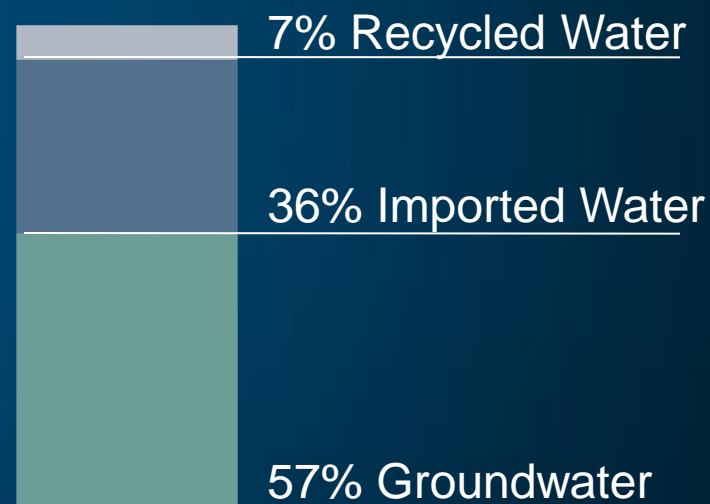


Scientific Investigations Report 2006-5092

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

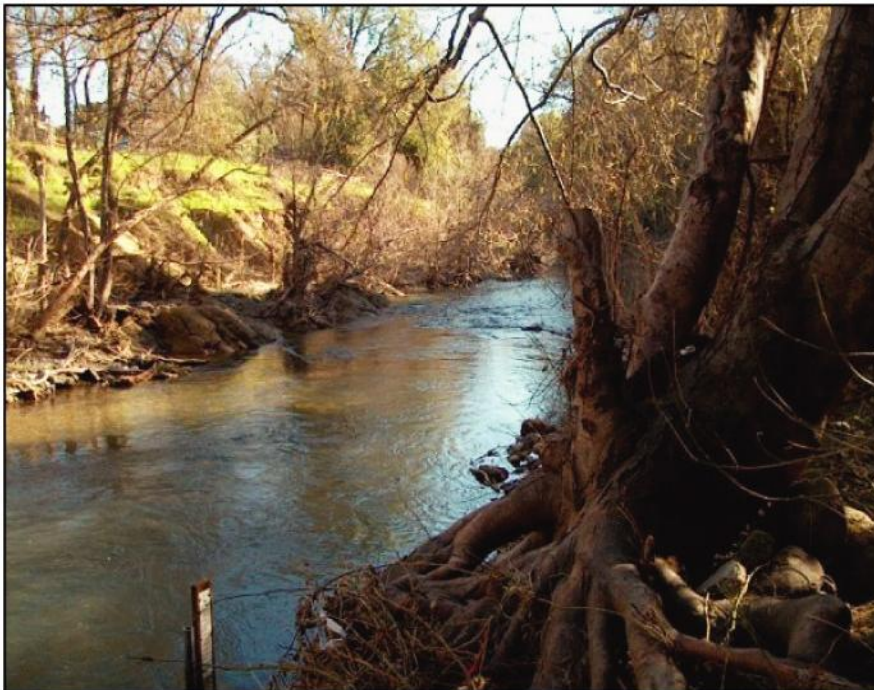
Water Use

15,000
acre-ft/year



In cooperation with the
SONOMA COUNTY WATER AGENCY

**Geohydrological Characterization, Water-Chemistry,
and Ground-Water Flow Simulation Model of the
Sonoma Valley Area, Sonoma County, California**



Scientific Investigations Report 2006-5092

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Increased Pumping

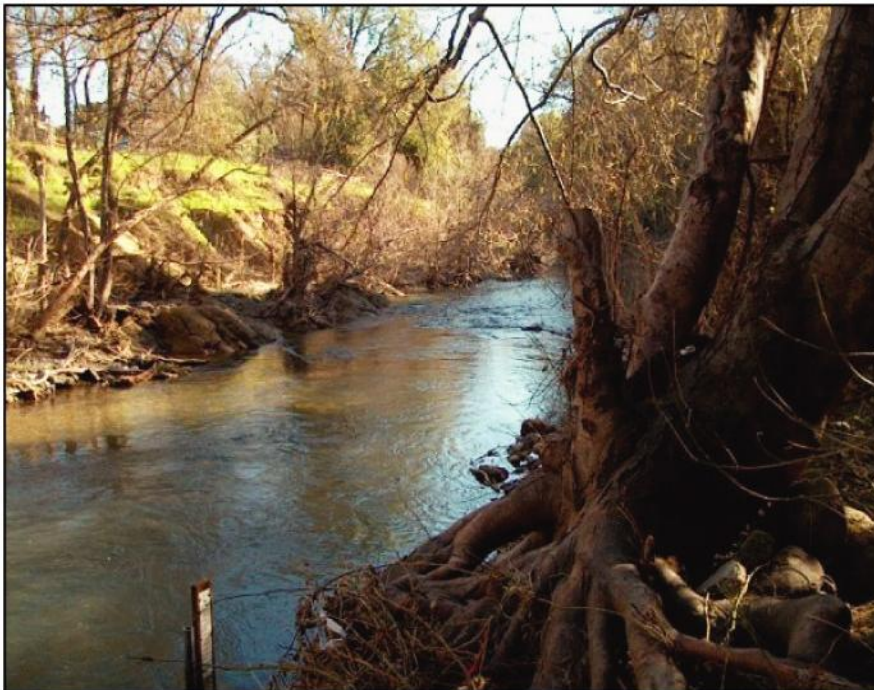
Between 1975 - 2000

8,500 acre-ft/year

6,000 acre-ft/year

In cooperation with the
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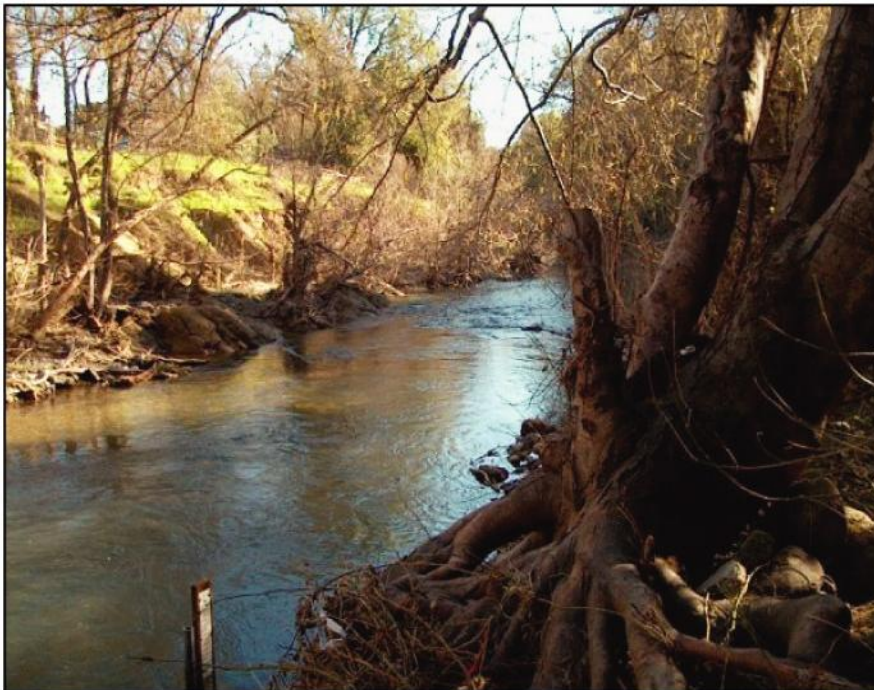
Localized Decline of Groundwater Levels

17,000 acre-ft

decline groundwater
storage over 25 years

In cooperation with the
SONOMA COUNTY WATER AGENCY

**Geohydrological Characterization, Water-Chemistry,
and Ground-Water Flow Simulation Model of the
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Scientific Investigations Report 2006-5092

**U.S. DEPARTMENT OF THE INTERIOR
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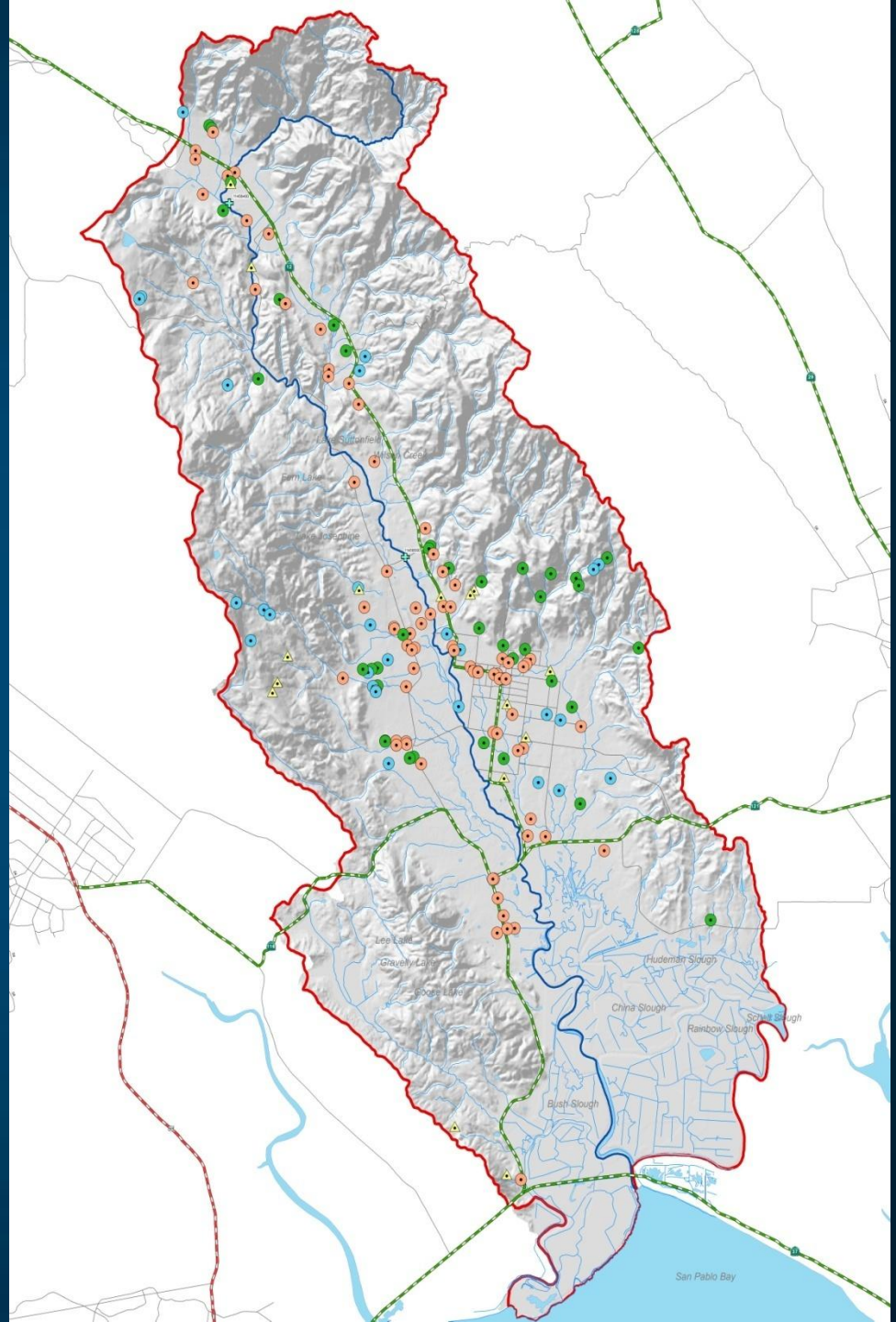
Salinity Issues

Groundwater quality
generally good, but
salinity issues in
southern part of
Valley

Management Strategies

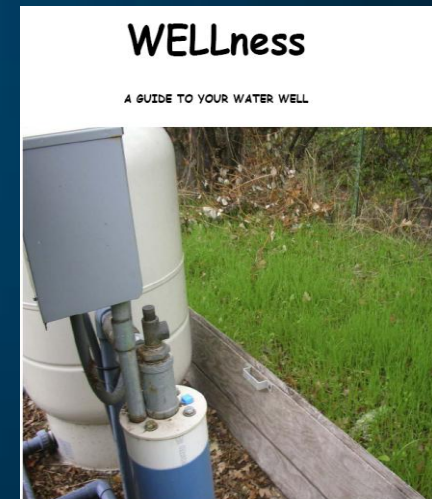
- **CONSERVATION** of Urban, Non-Urban, & Agriculture
- **RECYCLED WATER** use to offset groundwater pumping
- **STORMWATER** to recharge of groundwater
- **BANKING** Russian River water to recharge groundwater basin

- **80** – New Wells since 2007
- **140** - Wells with Synchronized Monitoring
- **Water Levels Only**
- **Confidential Secure web-based data management system**



Completed, Ongoing and Planned Activities

- Developed *Slow it. Spread it. Sink it!* Guidebook
- Updated WELLness guide for private well owners
- Initiated Annual Water Conservation Awards Program
- Installing Groundwater Monitoring Wells (DWR Grant)
- Potential Recharge Mapping (DWR Grant)
- Streamflow (Seepage) Measurements
- Water Quality Monitoring Program
- Groundwater Banking Feasibility Study and Stormwater Management & Groundwater Recharge Scoping Study



Ongoing Groundwater Management Program

- Ongoing TAC & BAP meetings and public outreach
- Continued project development and funding efforts
- Collaborative process to leverage combined resources
- Adaptive program management to achieve safe, reliable, sustainable water supply
- Recognition of basin-wide benefits to stakeholders

Santa Rosa Plain

Preliminary Groundwater

Management Planning Efforts

Center for Collaborative Policy

Impartial Stakeholder Assessment

55 Stakeholders Representing 37 Organizations

Agriculture

Business &
Developers

Conservation
&
Environmental

Government
(State, County
& City)

Rural
Residential
Well Owners

Scientists

Tribal

Water Supply
& Groundwater
Technical
People

Findings | Lack of Understanding

- Groundwater basin and its capacity
- Sustainable yield and cumulative effects of pumping
- Groundwater management & planning

Findings | **Technical Information Needed**

Planning is Critical, But **Some Are Skeptical**

Interest Group Dynamics: **Low Trust**

Need to Identify Rural Residential
Well Owner Representation

Preliminary Planning Completed

Steering Committee Formed

Groundwater Briefings and Informational Workshops

Explore Planning Options

Identify Interested Parties

Timeline

2010/2011

- **Briefings & Workshops**
- **Move forward with groundwater management planning as recommended by Steering Committee**

2012

- **Publish USGS Groundwater Report**
- **BAP works on Developing Groundwater Management Plan**

Questions / Discussion

www.scwa.ca.gov/srgroundwater